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LOOSMORE, Sheena M.  
SASAKI, Ken  
YANG, Yan-Ping  
KLEIN, Michel H.

<120> RECOMBINANT HIGH MOLECULAR WEIGHT MAJOR OUTER MEMBRANE  
PROTEIN OF MORAXELLA

<130> 1038-1063 MIS

<140> PCT/CA00/00870

<141> 2000-07-26

<150> 09/361,619

<151> 1999-07-27

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<170> PatentIn Ver. 2.1

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gaagtaacga	acttggttgg	tcttggtaat	gctggtaagt	ataacgtga	cggcaatcag	4740
gtaaacattg	ccgacatcaa	aaaagaccca	aattcagggtt	catcatctaa	ccgcactgtc	4800
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gggtggtatac	aagtgggcgt	ggataaagac	ggcaacgcta	acggcgattt	aagcaatggt	4920
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ggtcagacca	actatttgac	caacaacccc	gcagaagcca	ttgacagaat	aaatgaacaa	5040
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gatggtgaag	ccgccgttgc	cataggcaga	caaacccaag	caggcaacca	atccatcgcc	5220
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gtagcaggta	agcactctgg	tgccatcggc	gacccaagca	ctgttaaggc	tgataacagt	5340
tacagtgtgg	gtaataacaa	ccagtttacc	cgatgccactc	aaaccgatgt	ctttgggtgtg	5400
ggcaataaca	tcaccgtgac	cgaaagtaac	tcggttgctt	taggttcaaa	ctctgccatc	5460
agtgcaggca	cacacgcagg	cacacaagcc	aaaaaatctg	acggcacagc	aggtacaacc	5520
accacagcag	gtgcaaccgg	tacggttaaa	ggctttgctg	gacaaacggc	ggttggtgctg	5580
gtctccgtgg	gtgcctcagg	tgctgaacgc	cgtatccaaa	atgtggcagc	aggtgaggtc	5640
agtggccacca	gcaccgatgc	ggtcaatggt	agccagttgt	acaaagccac	ccaaagcatt	5700
gccaaacgcaa	ccaatgagct	tgaccatcgt	atccacaaa	acgaaaataa	ggccaatgca	5760
gggatttcat	cagcgatggc	gatggcgctc	atgccacaag	cctacattcc	tggcagatcc	5820
atgggttaccg	ggggtattgc	caccacaaac	ggtcaagggtg	cggtggcagt	gggactgtcg	5880

Substitute SeqListing.txt

aagctgtcgg ataatgggtca atgggtatttt aaaatcaatg gttcagccga tacccaaggc 5940  
catgtagggg cggcagttgg tgcaggtttt cacttt 5976

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<212> PRT  
<213> Moraxella catarrhalis

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Thr Ala Lys Ala Asp Gly Asp Arg Ala Ile Ala Ile Gly Glu Asn Ala  
35 40 45  
Asn Ala Gln Gly Gly Gln Ala Ile Ala Ile Gly Ser Ser Asn Lys Thr  
50 55 60  
Val Asn Gly Ser Ser Leu Asp Lys Ile Gly Thr Asp Ala Thr Gly Gln  
65 70 75 80  
Glu Ser Ile Ala Ile Gly Gly Asp Val Lys Ala Ser Gly Asp Ala Ser  
85 90 95  
Ile Ala Ile Gly Ser Asp Asp Leu His Leu Leu Asp Gln His Gly Asn  
100 105 110  
Pro Lys His Pro Lys Gly Thr Leu Ile Asn Asp Leu Ile Asn Gly His  
115 120 125  
Ala Val Leu Lys Glu Ile Arg Ser Ser Lys Asp Asn Asp Val Lys Tyr  
130 135 140  
Arg Arg Thr Thr Ala Ser Gly His Ala Ser Thr Ala Val Gly Ala Met  
145 150 155 160  
Ser Tyr Ala Gln Gly His Phe Ser Asn Ala Phe Gly Thr Arg Ala Thr  
165 170 175  
Ala Lys Ser Ala Tyr Ser Leu Ala Val Gly Leu Ala Ala Thr Ala Glu  
180 185 190  
Gly Gln Ser Thr Ile Ala Ile Gly Ser Asp Ala Thr Ser Ser Ser Leu  
195 200 205  
Gly Ala Ile Ala Leu Gly Ala Gly Thr Arg Ala Gln Leu Gln Gly Ser  
210 215 220  
Ile Ala Leu Gly Gln Gly Ser Val Val Thr Gln Ser Asp Asn Asn Ser  
225 230 235 240  
Arg Pro Ala Tyr Thr Pro Asn Thr Gln Ala Leu Asp Pro Lys Phe Gln  
245 250 255  
Ala Thr Asn Asn Thr Lys Ala Gly Pro Leu Ser Ile Gly Ser Asn Ser  
260 265 270  
Ile Lys Arg Lys Ile Ile Asn Val Gly Ala Gly Val Asn Lys Thr Asp  
275 280 285

Substitute SeqListing.txt

Ala Val Asn Val Ala Gln Leu Glu Ala Val Val Lys Trp Ala Lys Glu  
290 295 300  
Arg Arg Ile Thr Phe Gln Gly Asp Asp Asn Ser Thr Asp Val Lys Ile  
305 310 315 320  
Gly Leu Asp Asn Thr Leu Thr Ile Lys Gly Gly Ala Glu Thr Asn Ala  
325 330 335  
Leu Thr Asp Asn Asn Ile Gly Val Val Lys Glu Ala Asp Asn Ser Gly  
340 345 350  
Leu Lys Val Lys Leu Ala Lys Thr Leu Asn Asn Leu Thr Glu Val Asn  
355 360 365  
Thr Thr Thr Leu Asn Ala Thr Thr Thr Val Lys Val Gly Ser Ser Ser  
370 375 380  
Ser Thr Thr Ala Glu Leu Leu Ser Asp Ser Leu Thr Phe Thr Gln Pro  
385 390 395 400  
Asn Thr Gly Ser Gln Ser Thr Ser Lys Thr Val Tyr Gly Val Asn Gly  
405 410 415  
Val Lys Phe Thr Asn Asn Ala Glu Thr Thr Ala Ala Ile Gly Thr Thr  
420 425 430  
Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Arg Asp Gly Asp Val Asp  
435 440 445  
Glu Lys Gln Ala Pro Tyr Leu Asp Lys Lys Gln Leu Lys Val Gly Ser  
450 455 460  
Val Ala Ile Thr Ile Asp Asn Gly Ile Asp Ala Gly Asn Lys Lys Ile  
465 470 475 480  
Ser Asn Leu Ala Lys Gly Ser Ser Ala Asn Asp Ala Val Thr Ile Glu  
485 490 495  
Gln Leu Lys Ala Ala Lys Pro Thr Leu Asn Ala Gly Ala Gly Ile Ser  
500 505 510  
Val Thr Pro Thr Glu Ile Ser Val Asp Ala Lys Ser Gly Asn Val Thr  
515 520 525  
Ala Pro Thr Tyr Asn Ile Gly Val Lys Thr Thr Glu Leu Asn Ser Asp  
530 535 540  
Gly Thr Ser Asp Lys Phe Ser Val Lys Gly Ser Gly Thr Asn Asn Ser  
545 550 555 560  
Leu Val Thr Ala Glu His Leu Ala Ser Tyr Leu Asn Glu Val Asn Arg  
565 570 575  
Thr Ala Asp Ser Ala Leu Gln Ser Phe Thr Val Lys Glu Glu Asp Asp  
580 585 590  
Asp Asp Ala Asn Ala Ile Thr Val Ala Lys Asp Thr Thr Lys Asn Ala  
595 600 605  
Gly Ala Val Ser Ile Leu Lys Leu Lys Gly Lys Asn Gly Leu Thr Val  
610 615 620

# Substitute SeqListing.txt

Ala Thr Lys Lys Asp Gly Thr Val Thr Phe Gly Leu Ser Gln Asp Ser  
625 630 635 640

Gly Leu Thr Ile Gly Lys Ser Thr Leu Asn Asn Asp Gly Leu Thr Val  
645 650 655

Lys Asp Thr Asn Glu Gln Ile Gln Val Gly Ala Asn Gly Ile Lys Phe  
660 665 670

Thr Asn Val Asn Gly Ser Asn Pro Gly Thr Gly Ile Ala Asn Thr Ala  
675 680 685

Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Gly Ser Asp Gly Ala Val  
690 695 700

Asp Thr Asn Lys Pro Tyr Leu Asp Gln Asp Lys Leu Gln Val Gly Asn  
705 710 715 720

Val Lys Ile Thr Asn Thr Gly Ile Asn Ala Gly Gly Lys Ala Ile Thr  
725 730 735

Gly Leu Ser Pro Thr Leu Pro Ser Ile Ala Asp Gln Ser Ser Arg Asn  
740 745 750

Ile Glu Leu Gly Asn Thr Ile Gln Asp Lys Asp Lys Ser Asn Ala Ala  
755 760 765

Ser Ile Asn Asp Ile Leu Asn Thr Gly Phe Asn Leu Lys Asn Asn Asn  
770 775 780

Asn Pro Ile Asp Phe Val Ser Thr Tyr Asp Ile Val Asp Phe Ala Asn  
785 790 795 800

Gly Asn Ala Thr Thr Ala Thr Val Thr His Asp Thr Ala Asn Lys Thr  
805 810 815

Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile His Leu  
820 825 830

Thr Gly Thr Asp Asp Asn Lys Lys Leu Gly Val Lys Thr Thr Lys Leu  
835 840 845

Asn Lys Thr Ser Ala Asn Gly Asn Thr Ala Thr Asn Phe Asn Val Asn  
850 855 860

Ser Ser Asp Glu Asp Ala Leu Val Asn Ala Lys Asp Ile Ala Glu Asn  
865 870 875 880

Leu Asn Thr Leu Ala Lys Glu Ile His Thr Thr Lys Gly Thr Ala Asp  
885 890 895

Thr Ala Leu Gln Thr Phe Thr Val Lys Lys Val Asp Glu Asn Asn Asn  
900 905 910

Ala Asp Asp Ala Asn Ala Ile Thr Val Gly Gln Lys Asn Ala Asn Asn  
915 920 925

Gln Val Asn Thr Leu Thr Leu Lys Gly Glu Asn Gly Leu Asn Ile Lys  
930 935 940

Thr Asp Lys Asn Gly Thr Val Thr Phe Gly Ile Asn Thr Thr Ser Gly  
945 950 955 960

# Substitute SeqListing.txt

Leu Lys Ala Gly Lys Ser Thr Leu Asn Asp Gly Gly Leu Ser Ile Lys  
 965 970 975  
 Asn Pro Thr Gly Ser Glu Gln Ile Gln Val Gly Ala Asp Gly Val Lys  
 980 985 990  
 Phe Ala Lys Val Asn Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly  
 995 1000 1005  
 Thr Thr Arg Ile Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly  
 1010 1015 1020  
 Ser Leu Asp Lys Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala  
 1025 1030 1035 1040  
 Gly Gly Lys Lys Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Gln Asn  
 1045 1050 1055  
 Ser His Asp Ala Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu  
 1060 1065 1070  
 Leu Glu Asn Lys Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu  
 1075 1080 1085  
 His Glu Phe Ser Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser  
 1090 1095 1100  
 Asn Pro Tyr Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr  
 1105 1110 1115 1120  
 Phe Ala Gly Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val  
 1125 1130 1135  
 Arg Val Gly Ile Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr  
 1140 1145 1150  
 Val Gly Asn Asn Asn Gly Lys Gly Ile Val Ile Asp Ser Gln Asn Gly  
 1155 1160 1165  
 Gln Asn Thr Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn  
 1170 1175 1180  
 Asp Lys Gly Ser Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp  
 1185 1190 1195 1200  
 Glu Asp Lys Thr Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly  
 1205 1210 1215  
 Phe Asn Leu Gln Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr  
 1220 1225 1230  
 Asp Thr Val Asn Phe Ala Asp Gly Asn Ala Thr Thr Ala Lys Val Thr  
 1235 1240 1245  
 Tyr Asp Asp Thr Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val  
 1250 1255 1260  
 Asp Asp Thr Thr Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr  
 1265 1270 1275 1280  
 Thr Thr Leu Thr Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser  
 1285 1290 1295



# Substitute SeqListing.txt

Asn Gln Ala Thr Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala  
 1300 1305 1310  
 His Leu Asn Thr Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser  
 1315 1320 1325  
 Gln Ala Asn Asn Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val  
 1330 1335 1340  
 Ile Tyr Asp Ser Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly  
 1345 1350 1355 1360  
 Thr Val Asp Lys Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln  
 1365 1370 1375  
 Ala Gln Thr Pro Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val  
 1380 1385 1390  
 Ile Asn Lys Glu Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn  
 1395 1400 1405  
 Glu Asp Asn Ala Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn  
 1410 1415 1420  
 Lys Thr Lys Asn Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala  
 1425 1430 1435 1440  
 Gln Thr Pro Leu Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys  
 1445 1450 1455  
 Leu Gly Glu Thr Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys  
 1460 1465 1470  
 Leu Thr Asp Asn Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr  
 1475 1480 1485  
 Val Lys Leu Ala Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly  
 1490 1495 1500  
 Gly Thr Lys Ile Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly  
 1505 1510 1515 1520  
 Gln Ala Lys Ala Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu  
 1525 1530 1535  
 Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp  
 1540 1545 1550  
 Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu  
 1555 1560 1565  
 Gly Asn Ala Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala  
 1570 1575 1580  
 Asp Ile Lys Lys Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val  
 1585 1590 1595 1600  
 Ile Lys Ala Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu  
 1605 1610 1615  
 Lys Leu Ala Thr Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn  
 1620 1625 1630

# Substitute SeqListing.txt

Ala Asn Gly Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly  
1635 1640 1645

Ser Lys Lys Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn  
1650 1655 1660

Tyr Leu Thr Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln  
1665 1670 1675 1680

Gly Ile Arg Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val  
1685 1690 1695

Gln Gly Arg Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val  
1700 1705 1710

Ala Ile Gly Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile  
1715 1720 1725

Gly Arg Gln Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn  
1730 1735 1740

Ala Gln Ala Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val  
1745 1750 1755 1760

Val Ala Gly Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys  
1765 1770 1775

Ala Asp Asn Ser Tyr Ser Val Gly Asn Asn Asn Gln Phe Thr Asp Ala  
1780 1785 1790

Thr Gln Thr Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu  
1795 1800 1805

Ser Asn Ser Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr  
1810 1815 1820

His Ala Gly Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr  
1825 1830 1835 1840

Thr Thr Ala Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr  
1845 1850 1855

Ala Val Gly Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile  
1860 1865 1870

Gln Asn Val Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val  
1875 1880 1885

Asn Gly Ser Gln Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr  
1890 1895 1900

Asn Glu Leu Asp His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala  
1905 1910 1915 1920

Gly Ile Ser Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile  
1925 1930 1935

Pro Gly Arg Ser Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln  
1940 1945 1950

Gly Ala Val Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp  
1955 1960 1965

# Substitute SeqListing.txt

Val Phe Lys Ile Asn Gly Ser Ala Asp Thr Gln Gly His Val Gly Ala  
1970 1975 1980

Ala Val Gly Ala Gly Phe His Phe  
1985 1990

<210> 4

<211> 2047

<212> PRT

<213> Moraxella catarrhalis

<400> 4

Met Asn His Ile Tyr Lys Val Ile Phe Asn Lys Ala Thr Gly Thr Phe  
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Met Ala Val Ala Glu Tyr Ala Lys Ser His Ser Thr Gly Gly Gly Ser  
20 25 30

Cys Ala Thr Gly Gln Val Gly Ser Val Cys Thr Leu Ser Phe Ala Arg  
35 40 45

Ile Ala Ala Leu Ala Val Leu Val Ile Gly Ala Thr Leu Ser Gly Ser  
50 55 60

Ala Tyr Ala Gln Lys Lys Asp Thr Lys His Ile Ala Ile Gly Glu Gln  
65 70 75 80

Asn Gln Pro Arg Arg Ser Gly Thr Ala Lys Ala Asp Gly Asp Arg Ala  
85 90 95

Ile Ala Ile Gly Glu Asn Ala Asn Ala Gln Gly Gly Gln Ala Ile Ala  
100 105 110

Ile Gly Ser Ser Asn Lys Thr Val Asn Gly Ser Ser Leu Asp Lys Ile  
115 120 125

Gly Thr Asp Ala Thr Gly Gln Glu Ser Ile Ala Ile Gly Gly Asp Val  
130 135 140

Lys Ala Ser Gly Asp Ala Ser Ile Ala Ile Gly Ser Asp Asp Leu His  
145 150 155 160

Leu Leu Asp Gln His Gly Asn Pro Lys His Pro Lys Gly Thr Leu Ile  
165 170 175

Asn Asp Leu Ile Asn Gly His Ala Val Leu Lys Glu Ile Arg Ser Ser  
180 185 190

Lys Asp Asn Asp Val Lys Tyr Arg Arg Thr Thr Ala Ser Gly His Ala  
195 200 205

Ser Thr Ala Val Gly Ala Met Ser Tyr Ala Gln Gly His Phe Ser Asn  
210 215 220

Ala Phe Gly Thr Arg Ala Thr Ala Lys Ser Ala Tyr Ser Leu Ala Val  
225 230 235 240

Gly Leu Ala Ala Thr Ala Glu Gly Gln Ser Thr Ile Ala Ile Gly Ser  
245 250 255

Asp Ala Thr Ser Ser Ser Leu Gly Ala Ile Ala Leu Gly Ala Gly Thr  
Page 11

Substitute SeqListing.txt  
265 270

260

Arg Ala Gln Leu Gln Gly Ser Ile Ala Leu Gly Gln Gly Ser Val Val  
275 280 285

Thr Gln Ser Asp Asn Asn Ser Arg Pro Ala Tyr Thr Pro Asn Thr Gln  
290 295 300

Ala Leu Asp Pro Lys Phe Gln Ala Thr Asn Asn Thr Lys Ala Gly Pro  
305 310 315 320

Leu Ser Ile Gly Ser Asn Ser Ile Lys Arg Lys Ile Ile Asn Val Gly  
325 330 335

Ala Gly Val Asn Lys Thr Asp Ala Val Asn Val Ala Gln Leu Glu Ala  
340 345 350

Val Val Lys Trp Ala Lys Glu Arg Arg Ile Thr Phe Gln Gly Asp Asp  
355 360 365

Asn Ser Thr Asp Val Lys Ile Gly Leu Asp Asn Thr Leu Thr Ile Lys  
370 375 380

Gly Gly Ala Glu Thr Asn Ala Leu Thr Asp Asn Asn Ile Gly Val Val  
385 390 395 400

Lys Glu Ala Asp Asn Ser Gly Leu Lys Val Lys Leu Ala Lys Thr Leu  
405 410 415

Asn Asn Leu Thr Glu Val Asn Thr Thr Thr Leu Asn Ala Thr Thr Thr  
420 425 430

Val Lys Val Gly Ser Ser Ser Ser Thr Thr Ala Glu Leu Leu Ser Asp  
435 440 445

Ser Leu Thr Phe Thr Gln Pro Asn Thr Gly Ser Gln Ser Thr Ser Lys  
450 455 460

Thr Val Tyr Gly Val Asn Gly Val Lys Phe Thr Asn Asn Ala Glu Thr  
465 470 475 480

Thr Ala Ala Ile Gly Thr Thr Arg Ile Thr Arg Asp Lys Ile Gly Phe  
485 490 495

Ala Arg Asp Gly Asp Val Asp Glu Lys Gln Ala Pro Tyr Leu Asp Lys  
500 505 510

Lys Gln Leu Lys Val Gly Ser Val Ala Ile Thr Ile Asp Asn Gly Ile  
515 520 525

Asp Ala Gly Asn Lys Lys Ile Ser Asn Leu Ala Lys Gly Ser Ser Ala  
530 535 540

Asn Asp Ala Val Thr Ile Glu Gln Leu Lys Ala Ala Lys Pro Thr Leu  
545 550 555 560

Asn Ala Gly Ala Gly Ile Ser Val Thr Pro Thr Glu Ile Ser Val Asp  
565 570 575

Ala Lys Ser Gly Asn Val Thr Ala Pro Thr Tyr Asn Ile Gly Val Lys  
580 585 590

Thr Thr Glu Leu Asn Ser Asp Gly Thr Ser Asp Lys Phe Ser Val Lys

# Substitute SeqListing.txt

595

600

605

Gly Ser Gly Thr Asn Asn Ser Leu Val Thr Ala Glu His Leu Ala Ser  
610 615 620  
Tyr Leu Asn Glu Val Asn Arg Thr Ala Asp Ser Ala Leu Gln Ser Phe  
625 630 635 640  
Thr Val Lys Glu Glu Asp Asp Asp Asp Ala Asn Ala Ile Thr Val Ala  
645 650 655  
Lys Asp Thr Thr Lys Asn Ala Gly Ala Val Ser Ile Leu Lys Leu Lys  
660 665 670  
Gly Lys Asn Gly Leu Thr Val Ala Thr Lys Lys Asp Gly Thr Val Thr  
675 680 685  
Phe Gly Leu Ser Gln Asp Ser Gly Leu Thr Ile Gly Lys Ser Thr Leu  
690 695 700  
Asn Asn Asp Gly Leu Thr Val Lys Asp Thr Asn Glu Gln Ile Gln Val  
705 710 715 720  
Gly Ala Asn Gly Ile Lys Phe Thr Asn Val Asn Gly Ser Asn Pro Gly  
725 730 735  
Thr Gly Ile Ala Asn Thr Ala Arg Ile Thr Arg Asp Lys Ile Gly Phe  
740 745 750  
Ala Gly Ser Asp Gly Ala Val Asp Thr Asn Lys Pro Tyr Leu Asp Gln  
755 760 765  
Asp Lys Leu Gln Val Gly Asn Val Lys Ile Thr Asn Thr Gly Ile Asn  
770 775 780  
Ala Gly Gly Lys Ala Ile Thr Gly Leu Ser Pro Thr Leu Pro Ser Ile  
785 790 795 800  
Ala Asp Gln Ser Ser Arg Asn Ile Glu Leu Gly Asn Thr Ile Gln Asp  
805 810 815  
Lys Asp Lys Ser Asn Ala Ala Ser Ile Asn Asp Ile Leu Asn Thr Gly  
820 825 830  
Phe Asn Leu Lys Asn Asn Asn Asn Pro Ile Asp Phe Val Ser Thr Tyr  
835 840 845  
Asp Ile Val Asp Phe Ala Asn Gly Asn Ala Thr Thr Ala Thr Val Thr  
850 855 860  
His Asp Thr Ala Asn Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val  
865 870 875 880  
Asp Asp Thr Thr Ile His Leu Thr Gly Thr Asp Asp Asn Lys Lys Leu  
885 890 895  
Gly Val Lys Thr Thr Lys Leu Asn Lys Thr Ser Ala Asn Gly Asn Thr  
900 905 910  
Ala Thr Asn Phe Asn Val Asn Ser Ser Asp Glu Asp Ala Leu Val Asn  
915 920 925  
Ala Lys Asp Ile Ala Glu Asn Leu Asn Thr Leu Ala Lys Glu Ile His

Substitute SeqListing.txt

930 935 940  
 Thr Thr Lys Gly Thr Ala Asp Thr Ala Leu Gln Thr Phe Thr Val Lys  
 945 950 955 960  
 Lys Val Asp Glu Asn Asn Asn Ala Asp Asp Ala Asn Ala Ile Thr Val  
 965 970 975  
 Gly Gln Lys Asn Ala Asn Asn Gln Val Asn Thr Leu Thr Leu Lys Gly  
 980 985 990  
 Glu Asn Gly Leu Asn Ile Lys Thr Asp Lys Asn Gly Thr Val Thr Phe  
 995 1000 1005  
 Gly Ile Asn Thr Thr Ser Gly Leu Lys Ala Gly Lys Ser Thr Leu Asn  
 1010 1015 1020  
 Asp Gly Gly Leu Ser Ile Lys Asn Pro Thr Gly Ser Glu Gln Ile Gln  
 1025 1030 1035 1040  
 Val Gly Ala Asp Gly Val Lys Phe Ala Lys Val Asn Asn Asn Gly Val  
 1045 1050 1055  
 Val Gly Ala Gly Ile Asp Gly Thr Thr Arg Ile Thr Arg Asp Glu Ile  
 1060 1065 1070  
 Gly Phe Thr Gly Thr Asn Gly Ser Leu Asp Lys Ser Lys Pro His Leu  
 1075 1080 1085  
 Ser Lys Asp Gly Ile Asn Ala Gly Gly Lys Lys Ile Thr Asn Ile Gln  
 1090 1095 1100  
 Ser Gly Glu Ile Ala Gln Asn Ser His Asp Ala Val Thr Gly Gly Lys  
 1105 1110 1115 1120  
 Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn Lys Ile Ser Ser Thr Ala  
 1125 1130 1135  
 Lys Thr Ala Gln Asn Ser Leu His Glu Phe Ser Val Ala Asp Glu Gln  
 1140 1145 1150  
 Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr Ser Ser Tyr Asp Thr Ser  
 1155 1160 1165  
 Lys Thr Ser Asp Val Ile Thr Phe Ala Gly Glu Asn Gly Ile Thr Thr  
 1170 1175 1180  
 Lys Val Asn Lys Gly Val Val Arg Val Gly Ile Asp Gln Thr Lys Gly  
 1185 1190 1195 1200  
 Leu Thr Thr Pro Lys Leu Thr Val Gly Asn Asn Asn Gly Lys Gly Ile  
 1205 1210 1215  
 Val Ile Asp Ser Gln Asn Gly Gln Asn Thr Ile Thr Gly Leu Ser Asn  
 1220 1225 1230  
 Thr Leu Ala Asn Val Thr Asn Asp Lys Gly Ser Val Arg Thr Thr Glu  
 1235 1240 1245  
 Gln Gly Asn Ile Ile Lys Asp Glu Asp Lys Thr Arg Ala Ala Ser Ile  
 1250 1255 1260  
 Val Asp Val Leu Ser Ala Gly Phe Asn Leu Gln Gly Asn Gly Glu Ala

# Substitute SeqListing.txt

1265 1270 1275 1280  
Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asn Phe Ala Asp Gly Asn  
1285 1290 1295  
Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr Ser Lys Thr Ser Lys  
1300 1305 1310  
Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile Glu Val Lys Asp  
1315 1320 1325  
Lys Lys Leu Gly Val Lys Thr Thr Thr Leu Thr Ser Thr Gly Thr Gly  
1330 1335 1340  
Ala Asn Lys Phe Ala Leu Ser Asn Gln Ala Thr Gly Asp Ala Leu Val  
1345 1350 1355 1360  
Lys Ala Ser Asp Ile Val Ala His Leu Asn Thr Leu Ser Gly Asp Ile  
1365 1370 1375  
Gln Thr Ala Lys Gly Ala Ser Gln Ala Asn Asn Ser Ala Gly Tyr Val  
1380 1385 1390  
Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser Thr Asp Asn Lys Tyr  
1395 1400 1405  
Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp Lys Thr Lys Glu Val Ala  
1410 1415 1420  
Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro Asp Gly Thr Leu Ala  
1425 1430 1435 1440  
Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu Gln Val Asn Asp Ala  
1445 1450 1455  
Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala Phe Val Lys Gly Leu  
1460 1465 1470  
Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys Asn Ala Ala Val Thr Val  
1475 1480 1485  
Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu Thr Phe Ala Gly Asp  
1490 1495 1500  
Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu Thr Leu Thr Ile Lys Gly  
1505 1510 1515 1520  
Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn Asn Ile Gly Val Val  
1525 1530 1535  
Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala Lys Asp Leu Thr Asn  
1540 1545 1550  
Leu Asn Ser Val Asn Ala Gly Gly Thr Lys Ile Asp Asp Lys Gly Val  
1555 1560 1565  
Ser Phe Val Asp Ser Ser Gly Gln Ala Lys Ala Asn Thr Pro Val Leu  
1570 1575 1580  
Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Val Ile Ser Asn Val Gly  
1585 1590 1595 1600  
Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn Val Gln Gln Leu Asn Glu

# Substitute SeqListing.txt

1605                      1610                      1615  
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 Gly Asn Gln Val Asn Ile Ala Asp Ile Lys Lys Asp Pro Asn Ser Gly  
                                  1635                      1640                      1645  
 Ser Ser Ser Asn Arg Thr Val Ile Lys Ala Gly Thr Val Leu Gly Gly  
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 Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala Thr Gly Gly Ile Gln Val  
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 Gly Val Asp Lys Asp Gly Asn Ala Asn Gly Asp Leu Ser Asn Val Trp  
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 Val Lys Thr Gln Lys Asp Gly Ser Lys Lys Ala Leu Leu Ala Thr Tyr  
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 Asn Ala Ala Gly Gln Thr Asn Tyr Leu Thr Asn Asn Pro Ala Glu Ala  
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 Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg Phe Phe His Val Asn Asp  
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 Gly Asn Gln Glu Pro Val Val Gln Gly Arg Asn Gly Ile Asp Ser Ser  
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                                  1795                      1800                      1805  
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 Asn Asn Gln Phe Thr Asp Ala Thr Gln Thr Asp Val Phe Gly Val Gly  
                                  1845                      1850                      1855  
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                                  1875                      1880                      1885  
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                                  1890                      1895                      1900  
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                                  1905                      1910                      1915                      1920  
 Ser Gly Ala Glu Arg Arg Ile Gln Asn Val Ala Ala Gly Glu Val Ser  
                                  1925                      1930                      1935  
 Ala Thr Ser Thr Asp Ala Val Asn Gly Ser Gln Leu Tyr Lys Ala Thr



# Substitute SeqListing.txt

1940

1945

1950

Gln Ser Ile Ala Asn Ala Thr Asn Glu Leu Asp His Arg Ile His Gln  
1955 1960 1965

Asn Glu Asn Lys Ala Asn Ala Gly Ile Ser Ser Ala Met Ala Met Ala  
1970 1975 1980

Ser Met Pro Gln Ala Tyr Ile Pro Gly Arg Ser Met Val Thr Gly Gly  
1985 1990 1995 2000

Ile Ala Thr His Asn Gly Gln Gly Ala Val Ala Val Gly Leu Ser Lys  
2005 2010 2015

Leu Ser Asp Asn Gly Gln Trp Val Phe Lys Ile Asn Gly Ser Ala Asp  
2020 2025 2030

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2035 2040 2045

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<212> DNA

<213> Moraxella catarrhalis

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aatactgttg	ccatcattac	cataatttag	taacgcattt	agtaacgcat	ttgtaaaaaat	180
cattgcgccc	ctttatgtgt	atcatatgaa	tagaatatta	tgattgtatc	tgattattgt	240
atcagaatgg	tgatgtctata	tgatgatgcc	tacgagttga	tttgggttaa	tcactctatg	300
atttgatata	ttttgaaact	aatctattga	cttaaatcac	cataatggta	taatttagca	360
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# Substitute SeqListing.txt

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## Substitute SeqListing.txt

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&lt;211&gt; 6141

&lt;212&gt; DNA

&lt;213&gt; Moraxella catarrhalis

&lt;400&gt; 6

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Substitute SeqListing.txt

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gatgcggtga	atggttagcca	gttgtagcca	gcccacccaa	gcattgccaa	cgcaaccaat	5880
gagcttgacc	atcgtatcca	ccaaaacgaa	aataaggcca	atgcagggat	ttcatcagcg	5940
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# Substitute SeqListing.txt

attgccaccc acaacgggtca aggtgcggtg gcagtgggac tgtcgaagct gtcggataat 6060  
 ggtcaatggg tatttaaaat caatggttca gccgataccc aaggccatgt aggggcggca 6120  
 gttggtgcag gttttcactt t 6141

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 <213> Moraxella catarrhalis

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 Cys Ala Thr Gly Gln Val Gly Ser Val Cys Thr Leu Ser Phe Ala Arg  
 35 40 45  
 Ile Ala Ala Leu Ala Val Leu Val Ile Gly Ala Thr Leu Ser Gly Ser  
 50 55 60  
 Ala Tyr Ala Gln Lys Lys Asp Thr Lys His Ile Ala Ile Gly Glu Gln  
 65 70 75 80  
 Asn Gln Pro Arg Arg Ser Gly Thr Ala Lys Ala Asp Gly Asp Arg Ala  
 85 90 95  
 Ile Ala Ile Gly Glu Asn Ala Asn Ala Gln Gly Gly Gln Ala Ile Ala  
 100 105 110  
 Ile Gly Ser Ser Asn Lys Thr Val Asn Gly Ser Ser Leu Asp Lys Ile  
 115 120 125  
 Gly Thr Asp Ala Thr Gly Gln Glu Ser Ile Ala Ile Gly Gly Asp Val  
 130 135 140  
 Lys Ala Ser Gly Asp Ala Ser Ile Ala Ile Gly Ser Asp Asp Leu His  
 145 150 155 160  
 Leu Leu Asp Gln His Gly Asn Pro Lys His Pro Lys Gly Thr Leu Ile  
 165 170 175  
 Asn Asp Leu Ile Asn Gly His Ala Val Leu Lys Glu Ile Arg Ser Ser  
 180 185 190  
 Lys Asp Asn Asp Val Lys Tyr Arg Arg Thr Thr Ala Ser Gly His Ala  
 195 200 205  
 Ser Thr Ala Val Gly Ala Met Ser Tyr Ala Gln Gly His Phe Ser Asn  
 210 215 220  
 Ala Phe Gly Thr Arg Ala Thr Ala Lys Ser Ala Tyr Ser Leu Ala Val  
 225 230 235 240  
 Gly Leu Ala Ala Thr Ala Glu Gly Gln Ser Thr Ile Ala Ile Gly Ser  
 245 250 255  
 Asp Ala Thr Ser Ser Ser Leu Gly Ala Ile Ala Leu Gly Ala Gly Thr  
 260 265 270  
 Arg Ala Gln Leu Gln Gly Ser Ile Ala Leu Gly Gln Gly Ser Val Val

Substitute SeqListing.txt  
280 285

275  
Thr Gln Ser Asp Asn Asn Ser Arg Pro Ala Tyr Thr Pro Asn Thr Gln  
290 295 300  
Ala Leu Asp Pro Lys Phe Gln Ala Thr Asn Asn Thr Lys Ala Gly Pro  
305 310 315 320  
Leu Ser Ile Gly Ser Asn Ser Ile Lys Arg Lys Ile Ile Asn Val Gly  
325 330 335  
Ala Gly Val Asn Lys Thr Asp Ala Val Asn Val Ala Gln Leu Glu Ala  
340 345 350  
Val Val Lys Trp Ala Lys Glu Arg Arg Ile Thr Phe Gln Gly Asp Asp  
355 360 365  
Asn Ser Thr Asp Val Lys Ile Gly Leu Asp Asn Thr Leu Thr Ile Lys  
370 375 380  
Gly Gly Ala Glu Thr Asn Ala Leu Thr Asp Asn Asn Ile Gly Val Val  
385 390 395 400  
Lys Glu Ala Asp Asn Ser Gly Leu Lys Val Lys Leu Ala Lys Thr Leu  
405 410 415  
Asn Asn Leu Thr Glu Val Asn Thr Thr Thr Leu Asn Ala Thr Thr Thr  
420 425 430  
Val Lys Val Gly Ser Ser Ser Ser Thr Thr Ala Glu Leu Leu Ser Asp  
435 440 445  
Ser Leu Thr Phe Thr Gln Pro Asn Thr Gly Ser Gln Ser Thr Ser Lys  
450 455 460  
Thr Val Tyr Gly Val Asn Gly Val Lys Phe Thr Asn Asn Ala Glu Thr  
465 470 475 480  
Thr Ala Ala Ile Gly Thr Thr Arg Ile Thr Arg Asp Lys Ile Gly Phe  
485 490 495  
Ala Arg Asp Gly Asp Val Asp Glu Lys Gln Ala Pro Tyr Leu Asp Lys  
500 505 510  
Lys Gln Leu Lys Val Gly Ser Val Ala Ile Thr Ile Asp Asn Gly Ile  
515 520 525  
Asp Ala Gly Asn Lys Lys Ile Ser Asn Leu Ala Lys Gly Ser Ser Ala  
530 535 540  
Asn Asp Ala Val Thr Ile Glu Gln Leu Lys Ala Ala Lys Pro Thr Leu  
545 550 555 560  
Asn Ala Gly Ala Gly Ile Ser Val Thr Pro Thr Glu Ile Ser Val Asp  
565 570 575  
Ala Lys Ser Gly Asn Val Thr Ala Pro Thr Tyr Asn Ile Gly Val Lys  
580 585 590  
Thr Thr Glu Leu Asn Ser Asp Gly Thr Ser Asp Lys Phe Ser Val Lys  
595 600 605  
Gly Ser Gly Thr Asn Asn Ser Leu Val Thr Ala Glu His Leu Ala Ser

# Substitute SeqListing.txt

610		615		620	
Tyr 625	Leu	Asn	Glu	Val	Asn 630
					Arg
					Thr
					Ala
					Asp
					Ser 635
					Ala
					Leu
					Gln
					Ser
					Phe 640
Thr 645	Val	Lys	Glu	Glu 645	Asp
					Asp
					Asp
					Ala 650
					Asn
					Ala
					Ile
					Thr
					Val 655
Lys 660	Asp	Thr	Thr 660	Lys	Asn
					Ala
					Gly
					Ala 665
					Val
					Ser
					Ile
					Leu
					Lys 670
					Leu
					Lys
Gly 675	Lys	Asn	Gly	Leu	Thr
					Val
					Ala 680
					Thr
					Lys
					Lys
					Asp
					Gly 685
					Thr
					Val
					Thr
Phe 690	Gly	Leu	Ser	Gln	Asp
					Ser 695
					Gly
					Leu
					Thr
					Ile
					Gly 700
					Lys
					Ser
					Thr
					Leu
Asn 705	Asn	Asp	Gly	Leu	Thr
					Val 710
					Lys
					Asp
					Thr
					Asn 715
					Glu
					Gln
					Ile
					Gln
					Val 720
Gly 725	Ala	Asn	Gly	Ile 725	Lys
					Phe
					Thr
					Asn
					Val 730
					Asn
					Gly
					Ser
					Asn
					Pro 735
					Gly
Thr 740	Gly	Ile	Ala 740	Asn	Thr
					Ala
					Arg
					Ile 745
					Thr
					Arg
					Asp
					Lys
					Ile 750
					Gly
					Phe
Ala 755	Gly	Ser 755	Asp	Gly	Ala
					Val
					Asp 760
					Thr
					Asn
					Lys
					Pro
					Tyr 765
					Leu
					Asp
					Gln
Asp 770	Lys	Leu	Gln	Val	Gly
					Asn 775
					Val
					Lys
					Ile
					Thr
					Asn 780
					Thr
					Gly
					Ile
					Asn
Ala 785	Gly	Gly	Lys	Ala	Ile 790
					Thr
					Gly
					Leu
					Ser
					Pro 795
					Thr
					Leu
					Pro
					Ser
					Ile 800
Ala 805	Asp	Gln	Ser	Ser 805	Arg
					Asn
					Ile
					Glu
					Leu 810
					Gly
					Asn
					Thr
					Ile
					Gln 815
					Asp
Lys 820	Asp	Lys	Ser 820	Asn	Ala
					Ala
					Ser
					Ile 825
					Asn
					Asp
					Ile
					Leu
					Asn 830
					Thr
					Gly
Phe 835	Asn	Leu	Lys	Asn	Asn
					Asn 840
					Pro
					Ile
					Asp
					Phe
					Val 845
					Ser
					Thr
					Tyr
Asp 850	Ile	Val	Asp	Phe	Ala
					Asn 855
					Gly
					Asn
					Ala
					Thr
					Thr 860
					Ala
					Thr
					Val
					Thr
His 865	Asp	Thr	Ala	Asn	Lys
					Thr 870
					Ser
					Lys
					Val
					Val 875
					Tyr
					Asp
					Val
					Asn
					Val 880
Asp 885	Asp	Thr	Thr 885	Ile	His
					Leu
					Thr
					Gly
					Thr 890
					Asp
					Asp
					Asn
					Lys
					Lys 895
					Leu
Gly 900	Val	Lys	Thr 900	Thr	Lys
					Leu
					Asn
					Lys 905
					Thr
					Ser
					Ala
					Asn
					Gly 910
					Asn
					Thr
Ala 915	Thr	Asn	Phe	Asn	Val
					Asn 920
					Ser
					Ser
					Asp
					Glu
					Asp
					Ala 925
					Leu
					Val
					Asn
Ala 930	Lys	Asp	Ile	Ala	Glu
					Asn 935
					Leu
					Asn
					Thr
					Leu
					Ala 940
					Lys
					Glu
					Ile
					His
Thr 945	Thr	Lys	Gly	Thr	Ala
					Asp
					Thr
					Ala
					Leu
					Gln
					Thr
					Phe
					Thr
					Val
					Lys

# Substitute SeqListing.txt

945                      950                      955                      960  
 Lys Val Asp Glu Asn Asn Asn Ala Asp Asp Ala Asn Ala Ile Thr Val  
                                  965                                   970                                   975  
 Gly Gln Lys Asn Ala Asn Asn Gln Val Asn Thr Leu Thr Leu Lys Gly  
                                  980                                   985                                   990  
 Glu Asn Gly Leu Asn Ile Lys Thr Asp Lys Asn Gly Thr Val Thr Phe  
                                  995                                   1000                                   1005  
 Gly Ile Asn Thr Thr Ser Gly Leu Lys Ala Gly Lys Ser Thr Leu Asn  
                                  1010                                   1015                                   1020  
 Asp Gly Gly Leu Ser Ile Lys Asn Pro Thr Gly Ser Glu Gln Ile Gln  
                                  1025                                   1030                                   1035                                   1040  
 Val Gly Ala Asp Gly Val Lys Phe Ala Lys Val Asn Asn Asn Gly Val  
                                  1045                                   1050                                   1055  
 Val Gly Ala Gly Ile Asp Gly Thr Thr Arg Ile Thr Arg Asp Glu Ile  
                                  1060                                   1065                                   1070  
 Gly Phe Thr Gly Thr Asn Gly Ser Leu Asp Lys Ser Lys Pro His Leu  
                                  1075                                   1080                                   1085  
 Ser Lys Asp Gly Ile Asn Ala Gly Gly Lys Lys Ile Thr Asn Ile Gln  
                                  1090                                   1095                                   1100  
 Ser Gly Glu Ile Ala Gln Asn Ser His Asp Ala Val Thr Gly Gly Lys  
                                  1105                                   1110                                   1115                                   1120  
 Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn Lys Ile Ser Ser Thr Ala  
                                  1125                                   1130                                   1135  
 Lys Thr Ala Gln Asn Ser Leu His Glu Phe Ser Val Ala Asp Glu Gln  
                                  1140                                   1145                                   1150  
 Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr Ser Ser Tyr Asp Thr Ser  
                                  1155                                   1160                                   1165  
 Lys Thr Ser Asp Val Ile Thr Phe Ala Gly Glu Asn Gly Ile Thr Thr  
                                  1170                                   1175                                   1180  
 Lys Val Asn Lys Gly Val Val Arg Val Gly Ile Asp Gln Thr Lys Gly  
                                  1185                                   1190                                   1195                                   1200  
 Leu Thr Thr Pro Lys Leu Thr Val Gly Asn Asn Asn Gly Lys Gly Ile  
                                  1205                                   1210                                   1215  
 Val Ile Asp Ser Gln Asn Gly Gln Asn Thr Ile Thr Gly Leu Ser Asn  
                                  1220                                   1225                                   1230  
 Thr Leu Ala Asn Val Thr Asn Asp Lys Gly Ser Val Arg Thr Thr Glu  
                                  1235                                   1240                                   1245  
 Gln Gly Asn Ile Ile Lys Asp Glu Asp Lys Thr Arg Ala Ala Ser Ile  
                                  1250                                   1255                                   1260  
 Val Asp Val Leu Ser Ala Gly Phe Asn Leu Gln Gly Asn Gly Glu Ala  
                                  1265                                   1270                                   1275                                   1280  
 Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asn Phe Ala Asp Gly Asn



# Substitute SeqListing.txt

1285 1290 1295

Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr Ser Lys Thr Ser Lys  
1300 1305 1310

Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile Glu Val Lys Asp  
1315 1320 1325

Lys Lys Leu Gly Val Lys Thr Thr Thr Leu Thr Ser Thr Gly Thr Gly  
1330 1335 1340

Ala Asn Lys Phe Ala Leu Ser Asn Gln Ala Thr Gly Asp Ala Leu Val  
1345 1350 1355 1360

Lys Ala Ser Asp Ile Val Ala His Leu Asn Thr Leu Ser Gly Asp Ile  
1365 1370 1375

Gln Thr Ala Lys Gly Ala Ser Gln Ala Asn Asn Ser Ala Gly Tyr Val  
1380 1385 1390

Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser Thr Asp Asn Lys Tyr  
1395 1400 1405

Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp Lys Thr Lys Glu Val Ala  
1410 1415 1420

Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro Asp Gly Thr Leu Ala  
1425 1430 1435 1440

Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu Gln Val Asn Asp Ala  
1445 1450 1455

Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala Phe Val Lys Gly Leu  
1460 1465 1470

Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys Asn Ala Ala Val Thr Val  
1475 1480 1485

Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu Thr Phe Ala Gly Asp  
1490 1495 1500

Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu Thr Leu Thr Ile Lys Gly  
1505 1510 1515 1520

Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn Asn Ile Gly Val Val  
1525 1530 1535

Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala Lys Asp Leu Thr Asn  
1540 1545 1550

Leu Asn Ser Val Asn Ala Gly Gly Thr Lys Ile Asp Asp Lys Gly Val  
1555 1560 1565

Ser Phe Val Asp Ser Ser Gly Gln Ala Lys Ala Asn Thr Pro Val Leu  
1570 1575 1580

Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Val Ile Ser Asn Val Gly  
1585 1590 1595 1600

Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn Val Gln Gln Leu Asn Glu  
1605 1610 1615

Val Arg Asn Leu Leu Gly Leu Gly Asn Ala Gly Asn Asp Asn Ala Asp

Substitute SeqListing.txt

1620 1625 1630  
 Gly Asn Gln Val Asn Ile Ala Asp Ile Lys Lys Asp Pro Asn Ser Gly  
 1635 1640 1645  
 Ser Ser Ser Asn Arg Thr Val Ile Lys Ala Gly Thr Val Leu Gly Gly  
 1650 1655 1660  
 Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala Thr Gly Gly Ile Gln Val  
 1665 1670 1675 1680  
 Gly Val Asp Lys Asp Gly Asn Ala Asn Gly Asp Leu Ser Asn Val Trp  
 1685 1690 1695  
 Val Lys Thr Gln Lys Asp Gly Ser Lys Lys Ala Leu Leu Ala Thr Tyr  
 1700 1705 1710  
 Asn Ala Ala Gly Gln Thr Asn Tyr Leu Thr Asn Asn Pro Ala Glu Ala  
 1715 1720 1725  
 Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg Phe Phe His Val Asn Asp  
 1730 1735 1740  
 Gly Asn Gln Glu Pro Val Val Gln Gly Arg Asn Gly Ile Asp Ser Ser  
 1745 1750 1755 1760  
 Ala Ser Gly Lys His Ser Val Ala Ile Gly Phe Gln Ala Lys Ala Asp  
 1765 1770 1775  
 Gly Glu Ala Ala Val Ala Ile Gly Arg Gln Thr Gln Ala Gly Asn Gln  
 1780 1785 1790  
 Ser Ile Ala Ile Gly Asp Asn Ala Gln Ala Thr Gly Asp Gln Ser Ile  
 1795 1800 1805  
 Ala Ile Gly Thr Gly Asn Val Val Ala Gly Lys His Ser Gly Ala Ile  
 1810 1815 1820  
 Gly Asp Pro Ser Thr Val Lys Ala Asp Asn Ser Tyr Ser Val Gly Asn  
 1825 1830 1835 1840  
 Asn Asn Gln Phe Thr Asp Ala Thr Gln Thr Asp Val Phe Gly Val Gly  
 1845 1850 1855  
 Asn Asn Ile Thr Val Thr Glu Ser Asn Ser Val Ala Leu Gly Ser Asn  
 1860 1865 1870  
 Ser Ala Ile Ser Ala Gly Thr His Ala Gly Thr Gln Ala Lys Lys Ser  
 1875 1880 1885  
 Asp Gly Thr Ala Gly Thr Thr Thr Thr Ala Gly Ala Thr Gly Thr Val  
 1890 1895 1900  
 Lys Gly Phe Ala Gly Gln Thr Ala Val Gly Ala Val Ser Val Gly Ala  
 1905 1910 1915 1920  
 Ser Gly Ala Glu Arg Arg Ile Gln Asn Val Ala Ala Gly Glu Val Ser  
 1925 1930 1935  
 Ala Thr Ser Thr Asp Ala Val Asn Gly Ser Gln Leu Tyr Lys Ala Thr  
 1940 1945 1950  
 Gln Ser Ile Ala Asn Ala Thr Asn Glu Leu Asp His Arg Ile His Gln

# Substitute SeqListing.txt

1955 1960 1965  
 Asn Glu Asn Lys Ala Asn Ala Gly Ile Ser Ser Ala Met Ala Met Ala  
 1970 1975 1980  
 Ser Met Pro Gln Ala Tyr Ile Pro Gly Arg Ser Met Val Thr Gly Gly  
 1985 1990 1995 2000  
 Ile Ala Thr His Asn Gly Gln Gly Ala Val Ala Val Gly Leu Ser Lys  
 2005 2010 2015  
 Leu Ser Asp Asn Gly Gln Trp Val Phe Lys Ile Asn Gly Ser Ala Asp  
 2020 2025 2030  
 Thr Gln Gly His Val Gly Ala Ala Val Gly Ala Gly Phe His Phe  
 2035 2040 2045

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 <212> DNA  
 <213> Moraxella catarrhalis

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 gtacgcactc taagctttgc ccgtattgcc gcgctcgctg tcctcgtgat cgggtgcgacg 180  
 ctcaatggca gtgcttatgc tcaacaaatt actaccaaga tcgaaattgg tcaaacaaac 240  
 aagataaaca acacgctgaa aggcgatgcc ctacgcacag gtgaagcatc cattgctttt 300  
 ggtagtcttt ctaaggcaca aggcctctcaa gctattgcta tcggtagtgt caaaccagat 360  
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 caagccacaa aacaatcttc aatcgctggt ggttccaatg caaaagctaa cgcgtttgca 780  
 gcgacagcca ttggtggaaa tactgtagtt aatttgggtc gaggcgttgc cctagggttt 840  
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 ggttctcggg ataccgatgc ggtcaatgtg gcacagctta aattggtgga ggaactggct 1080  
 aatcgtaaaa ttacttttaa ggggtgatgg gacaataata gcaatagcgt agaaaagagt 1140  
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 gagctacaaa gcggtggttt gacctttagc ccaataacag gtacaaaaac agataaaaacc 1380  
 gtctacagca ttgatggatt gaagtttact aatgatagta atagtatagc aactaaaggt 1440  
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 agcaaacctt atcttgacaa cgaaaagcta aaagtgggca acagcacctt aaacagtggg 1560  
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 aatgctggta atcaaaagat taccggactt actaatggta tagcaaatat cgatgcgggtt 1860  
 accatcaaac agctcaaaaga cgccaaagcct actttaaacg caggcgatgg catcagtatt 1920  
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# Substitute SeqListing.txt

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&lt;211&gt; 2053

&lt;212&gt; PRT

&lt;213&gt; Moraxella catarrhalis

&lt;400&gt; 9

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35 40 45Ile Ala Ala Leu Ala Val Leu Val Ile Gly Ala Thr Leu Asn Gly Ser  
50 55 60Ala Tyr Ala Gln Gln Ile Thr Thr Lys Ile Glu Ile Gly Gln Thr Asn  
65 70 75 80Lys Ile Asn Asn Thr Leu Lys Gly Asp Ala Leu Ala Thr Gly Glu Ala  
85 90 95Ser Ile Ala Phe Gly Ser Leu Ser Lys Ala Gln Gly Ser Gln Ala Ile  
100 105 110Ala Ile Gly Ser Val Lys Pro Asp Pro Asn Asn Gly Ser Asn Gly Asn  
115 120 125Val Gly Ser His Ala Lys Gly Asn Glu Ser Ile Ala Ile Gly Gly Asp  
130 135 140Val Leu Ala Glu Gly Asp Ala Ser Ile Ala Ile Gly Ser Asp Asp Leu  
145 150 155 160Tyr Leu Pro Lys Asn Leu Asp Leu Lys Asn Glu Phe His Lys Leu Ile  
165 170 175His Gly His Glu Ile Leu Lys Lys Ile Gln Thr Ser Thr Asp Gly Lys  
180 185 190Ile Lys Tyr Arg Arg Thr Arg Ala Gln Gly His Ala Ser Thr Ala Val  
195 200 205Gly Ala Met Ser Tyr Ala Gln Gly His Phe Ser Asn Ala Phe Gly Thr  
210 215 220Tyr Ala Thr Ala Glu Ala Ala Tyr Ser Leu Ala Val Gly Leu Ala Ala  
225 230 235 240Gln Ala Thr Lys Gln Ser Ser Ile Ala Val Gly Ser Asn Ala Lys Ala  
245 250 255Asn Ala Phe Ala Ala Thr Ala Ile Gly Gly Asn Thr Val Val Asn Leu  
260 265 270Gly Arg Gly Val Ala Leu Gly Phe Gly Ser Gln Ile Leu Asp Arg Asp  
275 280 285

# Substitute SeqListing.txt

Asn 290 Thr Asp Ala Ser 295 Tyr Val Pro Leu 300 Gly Lys Thr Leu Ala  
 Asp 305 Gln Tyr Lys Ala Thr 310 Arg Gln Gly Asp 315 Ser Thr Asp Ile Phe Ser 320  
 Ile Gly Asn Ser 325 Asn Asn Asn Ser 330 Ile Arg Arg Lys 335 Ile Ile  
 Asn Val Gly 340 Ala Gly Ser Arg Asp 345 Thr Asp Ala Val Asn 350 Val Ala Gln  
 Leu Lys 355 Leu Val Glu Glu Leu 360 Ala Asn Arg Lys Ile Thr 365 Phe Lys Gly  
 Asp 370 Gly Asp Asn Asn Ser 375 Asn Ser Val Glu Arg Gly 380 Leu Gly Asn Thr  
 Leu 385 Thr Ile Lys Gly Asp 390 Ala Gln Thr Asn 395 Ala Leu Thr Glu Ala Asn 400  
 Ile Gly Val Val Thr 405 Asp Gly Asn Gly Leu 410 Lys Val Lys Leu Ala 415 Lys  
 Glu Leu Thr 420 Gly Leu Thr Ser Val 425 Ser Ala Thr Asn Lys 430 Ile Thr Val  
 Ser Asn Thr 435 Asn Asn Asn Asn Ala 440 Glu Leu Gln Ser Gly 445 Gly Leu Thr  
 Phe Ser 450 Pro Ile Thr Gly Thr 455 Lys Thr Asp Lys Thr 460 Val Tyr Ser Ile  
 Asp 465 Gly Leu Lys Phe Thr 470 Asn Asp Ser Asn Ser 475 Ile Ala Thr Lys Gly 480  
 Thr Thr Arg Ile Thr 485 Lys Lys Lys Ile Gly 490 Phe Ala Gly Thr Asn 495 Asp  
 Gly Val Asp 500 Glu Ser Lys Pro Tyr Leu 505 Asp Asn Glu Lys Leu 510 Lys Val  
 Gly Asn Ser 515 Thr Leu Asn Ser Gly 520 Ser Leu Thr Val Asn 525 Asn Thr Thr  
 Gly Asn 530 Lys Gln Ile Gln Val 535 Gly Ala Asn Gly Ile 540 Lys Phe Ala Thr  
 Val 545 Ala Asn Asn Val Ala 550 Asn Thr Ser Ala Thr 555 Val Gly Thr Ala Arg 560  
 Ile Thr Glu Glu Lys 565 Ile Gly Phe Ala Gly 570 Thr Asn Asp Gly Val 575 Asp  
 Glu Gln Ala Pro 580 Tyr Leu Asp Lys Glu 585 Arg Leu Lys Val Gly 590 Arg Val  
 Glu Ile Thr 595 Thr Asp Ser Gly Ile 600 Asn Ala Gly Asn His 605 Lys Ile Thr  
 Gly Leu 610 Thr Asn Gly Ile Ala 615 Asn Thr Asp Ala Val 620 Thr Ile Lys Gln

Substitute SeqListing.txt

Leu Lys Asp Ala Lys Pro Thr Leu Asn Ala Gly Asp Gly Ile Ser Ile  
 625 630 635 640  
 Asn Ser Asn Asn Gly Asp Leu Val Asp Ser Ser Gly Asn Ile Thr Thr  
 645 650 655  
 Pro Thr Tyr Asn Ile Ser Val Lys Thr Thr Lys Leu Asn Ser Asn Gly  
 660 665 670  
 Thr Ser Gly Asn Asn Lys Phe Ser Val Ser Asn Ala His Asp Asn Asn  
 675 680 685  
 Ser Leu Val Thr Ala Lys Asp Leu Ala Asp Tyr Leu Asn Lys Val Asn  
 690 695 700  
 Glu Thr Ala Asp Ser Ala Leu Pro Ser Phe Lys Val Gln Asn Gly Asp  
 705 710 715 720  
 Asn Ser Asn Asn Ala Ile Thr Val Gly Lys Asp Thr Asn Gly Lys Thr  
 725 730 735  
 Phe Asn Thr Leu Lys Leu Lys Gly Glu Asn Gly Val Asn Ile Thr Thr  
 740 745 750  
 Asn Arg Ala Thr Gly Thr Val Thr Phe Gly Ile Asp Gln Ser Asn Gly  
 755 760 765  
 Leu Thr Thr Pro Lys Leu Thr Val Gly Ser Asp Thr Asn Gly Asn Arg  
 770 775 780  
 Leu Val Ile Glu Gln Val Pro Ser Ala Asp Gly Asn Ser Thr Lys Asn  
 785 790 795 800  
 Ile Ile Lys Gly Leu Ser Pro Thr Leu Pro Ser Ile Ala Ser Pro Ser  
 805 810 815  
 Gly Arg Asn Ile Ala Leu Gly Asn Thr Ile Glu Glu Lys Asp Lys Ser  
 820 825 830  
 Asn Ala Ala Ser Ile Asp Asp Val Leu Asn Ala Gly Phe Asn Leu Lys  
 835 840 845  
 Asn Asn Gly Lys Asp Lys Asp Phe Val Ser Thr Tyr Asp Thr Val Asp  
 850 855 860  
 Phe Ile Asp Gly Asn Ala Thr Thr Ala Thr Val Thr Tyr Asp Glu Ala  
 865 870 875 880  
 Asn Gln Thr Ser Lys Val Ala Tyr Asp Val Asn Val Asp Glu Lys Thr  
 885 890 895  
 Ile Glu Leu Thr Gly Asp Asn Gly Lys Lys Gln Leu Gly Val Lys Thr  
 900 905 910  
 Ile Lys Leu Thr Glu Thr Ser Thr Asn Gly Asn Ala Thr Thr Phe Ser  
 915 920 925  
 Thr Asp Asp Asp His Ala Leu Val Lys Ala Ser Asp Ile Ala Gly Asn  
 930 935 940  
 Leu Asn Thr Leu Ala Glu Glu Ile His Thr Thr Lys Gly Thr Ala Asn  
 945 950 955 960

# Substitute SeqListing.txt

Thr Ala Leu Gln Thr Phe Thr Val Lys Lys Val Asp Glu Asn Asp Lys  
 965 970 975  
 Ala Asp Asp Thr Asn Ala Ile Thr Val Gly Lys Asp Gly Thr Ser Gly  
 980 985 990  
 Lys Val Asn Thr Leu Lys Leu Lys Gly Lys Asn Gly Leu Asp Ile Lys  
 995 1000 1005  
 Thr Asp Lys Asp Gly Thr Val Thr Phe Gly Ile Asn Thr Gln Ser Gly  
 1010 1015 1020  
 Leu Lys Ala Gly Asp Ser Thr Thr Leu Asn Asn Asn Gly Leu Ser Ile  
 1025 1030 1035 1040  
 Lys Asn Thr Ala Ser Asn Glu Gln Ile Gln Val Gly Ala Asp Gly Val  
 1045 1050 1055  
 Lys Phe Ala Met Val Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly  
 1060 1065 1070  
 Thr Thr Arg Ile Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly  
 1075 1080 1085  
 Ser Leu Asp Lys Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala  
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 Gly Gly Lys Lys Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Lys Asn  
 1105 1110 1115 1120  
 Ser His Asp Ala Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu  
 1125 1130 1135  
 Leu Glu Asn Lys Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu  
 1140 1145 1150  
 His Glu Phe Ser Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser  
 1155 1160 1165  
 Asn Pro Tyr Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr  
 1170 1175 1180  
 Phe Ala Gly Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val  
 1185 1190 1195 1200  
 Arg Val Gly Ile Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr  
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 Val Gly Asn Asn Asn Gly Lys Gly Ile Val Ile Asn Ser Gln Asn Gly  
 1220 1225 1230  
 Gln Asn Thr Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn  
 1235 1240 1245  
 Asp Lys Gly Ser Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp  
 1250 1255 1260  
 Glu Asp Lys Thr Arg Ala Ser Ile Val Asp Val Leu Ser Ala Gly  
 1265 1270 1275 1280  
 Phe Asn Leu Gln Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr  
 1285 1290 1295



# Substitute SeqListing.txt

Asp Thr Val Asn Phe Ala Asn Gly Asn Thr Thr Thr Ala Lys Val Thr  
 1300 1305 1310  
 Tyr Asp Asp Thr Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val  
 1315 1320 1325  
 Asp Asp Thr Thr Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr  
 1330 1335 1340  
 Thr Thr Leu Thr Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser  
 1345 1350 1355 1360  
 Asn Gln Ala Thr Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala  
 1365 1370 1375  
 His Leu Asn Thr Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser  
 1380 1385 1390  
 Gln Ala Asn Asn Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val  
 1395 1400 1405  
 Ile Tyr Asp Ser Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly  
 1410 1415 1420  
 Thr Val Asp Lys Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln  
 1425 1430 1435 1440  
 Ala Gln Thr Pro Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val  
 1445 1450 1455  
 Ile Asn Lys Glu Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn  
 1460 1465 1470  
 Glu Asp Asn Ala Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn  
 1475 1480 1485  
 Lys Thr Lys Asn Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala  
 1490 1495 1500  
 Gln Thr Pro Leu Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys  
 1505 1510 1515 1520  
 Leu Gly Glu Thr Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys  
 1525 1530 1535  
 Leu Thr Asp Asn Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr  
 1540 1545 1550  
 Val Lys Leu Ala Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly  
 1555 1560 1565  
 Gly Thr Lys Ile Asp Glu Lys Gly Ile Ser Phe Val Asp Ala Asn Gly  
 1570 1575 1580  
 Gln Ala Lys Ala Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu  
 1585 1590 1595 1600  
 Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp  
 1605 1610 1615  
 Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu  
 1620 1625 1630

Substitute SeqListing.txt

Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala Asp Ile Lys  
1635 1640 1645

Lys Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val Ile Lys Ala  
1650 1655 1660

Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala  
1665 1670 1675 1680

Thr Gly Gly Val Gln Val Gly Val Asp Lys Asp Gly Asn Ala Asn Gly  
1685 1690 1695

Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly Ser Lys Lys  
1700 1705 1710

Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn Tyr Val Thr  
1715 1720 1725

Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg  
1730 1735 1740

Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val Gln Gly Arg  
1745 1750 1755 1760

Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val Ala Ile Gly  
1765 1770 1775

Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile Gly Arg Gln  
1780 1785 1790

Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn Ala Gln Ala  
1795 1800 1805

Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val Val Ala Gly  
1810 1815 1820

Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys Ala Asp Asn  
1825 1830 1835 1840

Ser Tyr Ser Val Gly Asn Asn Asn Gln Phe Thr Asp Ala Thr Gln Thr  
1845 1850 1855

Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu Ser Asn Ser  
1860 1865 1870

Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr His Ala Gly  
1875 1880 1885

Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr Thr Ala  
1890 1895 1900

Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr Ala Val Gly  
1905 1910 1915 1920

Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile Gln Asn Val  
1925 1930 1935

Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val Asn Gly Ser  
1940 1945 1950

Gln Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr Asn Glu Leu  
1955 1960 1965

# Substitute SeqListing.txt

Asp His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala Gly Ile Ser  
1970 1975 1980

Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile Pro Gly Arg  
1985 1990 1995 2000

Ser Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln Gly Ala Val  
2005 2010 2015

Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp Val Phe Lys  
2020 2025 2030

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Ala Gly Phe His Phe  
2050

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## Substitute SeqListing.txt

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# Substitute SeqListing.txt

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<212> PRT

<213> Moraxella catarrhalis

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20 25 30

Ser Thr Ala Gly Gln Val Gly Ser Ser Pro Val Ile Arg Leu Thr Arg  
35 40 45

Val Ala Thr Leu Ala Ile Leu Val Ile Gly Ala Thr Leu Asn Gly Ser  
50 55 60

Ala Tyr Ala Gln Asn Asn Ser Lys Ile Ala Phe Gly Thr Thr Gly Asn  
65 70 75 80

Asn Asp Asn Ala Ser Ala Ser Asn Glu Ala Ser Ile Ala Ile Gly Ser  
85 90 95

Leu Ala Lys Ala His Ala Asn Gln Ala Ile Ala Ile Gly Gly Ser Lys  
100 105 110

Pro Asp Pro Arg Asn Gln Ala Ala Asn Gln Lys Ala Gly Ser His Ala  
115 120 125

Lys Gly Lys Glu Ser Ile Ala Ile Gly Gly Asp Val Leu Ala Glu Gly  
130 135 140

Asp Ala Ser Ile Ala Ile Gly Ser Asp Asp Leu Tyr Leu Asp Arg Asn  
145 150 155 160

Ser Thr Asn Ser Lys Tyr Pro Asn Gly Leu Leu Ser Thr Leu Ile Gln  
165 170 175

Asn His Thr Val Leu Arg Gln Ile Arg Asp Ser Asn Gly Ser Gln Lys  
180 185 190

Tyr Arg Arg Thr Ala Ala Glu Gly His Ala Ser Thr Ala Val Gly Ala  
195 200 205

Met Ala Tyr Ala Lys Gly His Phe Ala Asn Ala Phe Gly Thr Arg Ser

Substitute SeqListing.txt

210 215 220  
 Thr Ala Glu Gly Asn Tyr Ser Leu Ala Val Gly Leu Thr Ala Lys Ala  
 225 230 235 240  
 Glu Lys Gly Tyr Thr Ile Ala Ile Gly Ser Asn Ala Gln Ala Ile Asn  
 245 250 255  
 Tyr Gly Ala Leu Ala Leu Gly Ala Asp Thr Arg Val Asp Leu Asp Tyr  
 260 265 270  
 Gly Ile Ala Leu Gly Tyr Gly Ser Gln Ile Leu Asn Asn Asn Asn Asn  
 275 280 285  
 Asn Asn Asn Lys Ala Tyr Val Pro Glu Gly Asn Gly Ser Asn Ile Lys  
 290 295 300  
 Ser Ser Lys Ala Thr Gly Asn Gly Leu Phe Ser Ile Gly Ser Ser Thr  
 305 310 315 320  
 Ile Lys Arg Lys Ile Ile Asn Val Gly Ala Gly Tyr Glu Asp Thr Asp  
 325 330 335  
 Ala Val Asn Val Ala Gln Leu Lys Ala Val Glu Asn Leu Ala Lys Arg  
 340 345 350  
 Gln Ile Thr Phe Lys Gly Asp Asp Asn Gly Thr Gly Val Lys Lys Lys  
 355 360 365  
 Leu Gly Glu Thr Leu Thr Ile Lys Gly Gly Glu Thr Gln Ala Asp Lys  
 370 375 380  
 Leu Thr Asp Asn Asn Asn Ile Gly Val Val Thr Asp Asn Asn Thr Gly  
 385 390 395 400  
 Leu Lys Val Lys Leu Ala Lys Asn Leu Ser Gly Leu Glu Thr Val Ser  
 405 410 415  
 Thr Lys Asn Leu Thr Ala Ser Glu Lys Val Thr Val Gly Ser Gly Asn  
 420 425 430  
 Asn Thr Ala Glu Leu Gln Ser Gly Gly Leu Thr Phe Thr Pro Thr Thr  
 435 440 445  
 Asn Ala Ser Thr Asp Lys Thr Val Tyr Gly Thr Asp Gly Leu Lys Phe  
 450 455 460  
 Thr Asp Asn Ser Asn Thr Ala Leu Glu Asp Thr Thr Arg Ile Thr Lys  
 465 470 475 480  
 Asp Lys Ile Gly Phe Ser Asn Lys Ala Gly Thr Val Asp Glu Asn Lys  
 485 490 495  
 Pro Tyr Leu Asp Lys Asp Lys Leu Lys Val Gly Asn Ser Thr Leu Asn  
 500 505 510  
 Asn Gly Gly Leu Thr Val Asn Asn Thr Ile Gly Gly Ser Asn Lys Gln  
 515 520 525  
 Ile Gln Val Gly Ala Asp Gly Ile Lys Phe Ala Asp Val Asn Val Asn  
 530 535 540  
 Val Ser Asn Ala Ala Lys Phe Gly Thr Thr Arg Ile Thr Glu Glu Glu

# Substitute SeqListing.txt

545                      550                      555                      560

Ile Gly Phe Ala Asp 565 Ala Asp Gly Lys Val 570 Asp Lys Lys Ser Pro Tyr

Leu Asp Lys Lys 580 Gln Leu Gln Val 585 Gly Gly Val Lys Ile Thr Lys Asp

ser Gly Ile 595 Asn Ala Gly Asp 600 Gln Lys Ile Ser Asn Val 605 Lys Asp Ala

Thr Asp 610 Asp Thr Asp Ala Val 615 Thr Tyr Lys Gln Leu 620 Lys Gln Val Gln

Gln Asp Ala Asp Gly 630 Ala Leu Gln Ser Phe 635 Ser Ile Arg Asp Glu Lys 640

Gly Gln Glu Phe Thr 645 Ile Ser Asn Leu Tyr 650 Ser Asn Gly Asn Thr Pro

Asn Thr Phe 660 Glu Thr Ile Thr Phe 665 Ala Gly Glu Asn Gly Ile 670 Ser Ile

Ser Asn Asp 675 Ile Ala Lys Gly Lys 680 Val Lys Val Gly Ile 685 Asp Pro Ile

Asn Gly 690 Leu Thr Thr Pro Lys 695 Leu Thr Val Gly Ser 700 Asp Lys Asp Gly

Lys Thr Gln Leu Val 710 Ile Glu Gln Val Ala Ser 715 Gly Asn Asp Thr Lys 720

Asn Ile Ile Arg Gly 725 Leu Ser Pro Thr Leu 730 Pro Ser Ile Thr Asn Ala 735

Gly Gly Val Arg 740 Thr Thr Glu Gln Gly 745 Asn Thr Ile Thr Ser 750 Asp Glu

Asp Lys Ser 755 Lys Ala Ala Ser Ile 760 Gly Asp Ile Leu Asn 765 Thr Gly Phe

Asn Leu 770 Lys Asn Asn Ser Asn 775 Ser Val Gly Phe Val 780 Ser Thr Tyr Asn

Thr Val Asp Phe Ile Asp 790 Gly Asn Ala Thr Thr 795 Ala Lys Val Thr Tyr 800

Asp Glu Thr Asn 805 Gln Thr Ser Lys Val Thr 810 Tyr Asp Val Asn Val 815 Asp

Glu Lys Thr Ile 820 Glu Leu Thr Gly Asp 825 Asn Gly Lys Thr Asn Lys Ile

Gly Val Lys 835 Thr Thr Thr Leu Thr 840 Thr Thr Asn Ala Asn 845 Gly Lys Ala

Thr Asn Phe Ser Thr Thr Asp 855 Asn Asp Ala Leu Val 860 Asn Ala Lys Asp

Ile Ala Glu Asn Leu Asn 870 Thr Leu Ala Lys Glu 875 Ile His Thr Thr Lys 880

Gly Thr Ala Asp Thr Ala Leu Gln Thr Phe Lys Val Lys Lys Asp Gly

Substitute SeqListing.txt

885 890 895

Ala Thr Asp Asp Glu Thr Ile Thr Val Gly Lys Asp Gly Thr Gln Asn  
900 905 910

Gly Lys Thr Val Asn Thr Leu Lys Leu Lys Gly Glu Asn Gly Leu Thr  
915 920 925

Val Ala Thr Asn Lys Asp Gly Thr Val Thr Phe Gly Ile Asn Thr Gln  
930 935 940

Ser Gly Leu Lys Ala Gly Asp Ser Thr Thr Leu Asn Lys Asp Gly Leu  
945 950 955 960

Ser Ile Lys Asn Pro Ala Ser Asn Glu Gln Ile Gln Val Gly Ala Asp  
965 970 975

Gly Val Lys Phe Ala Lys Val Asp Lys Gly Asn Ser Ser Thr Gly Ile  
980 985 990

Asp Gly Thr Ser Arg Ile Thr Lys Asp Gln Ile Gly Phe Thr Gly Ala  
995 1000 1005

Asn Gly Ser Leu Asp Thr Thr Lys Pro His Leu Thr Lys Asp Lys Leu  
1010 1015 1020

Lys Val Gly Glu Val Glu Ile Thr Asn Thr Gly Ile Asn Ala Gly Gly  
1025 1030 1035 1040

Lys Lys Ile Thr Asn Ile Gln Ser Gly Asp Ile Thr Gln Asn Ser Asn  
1045 1050 1055

Asp Ala Val Thr Gly Gly Arg Val Tyr Asp Leu Lys Thr Glu Leu Glu  
1060 1065 1070

Ser Lys Ile Asn Ser Ala Ala Lys Thr Ala Gln Asn Ser Leu His Glu  
1075 1080 1085

Phe Ser Val Ala Asp Glu Gln Gly Asn His Phe Thr Val Ser Asn Pro  
1090 1095 1100

Tyr Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr Phe Ala  
1105 1110 1115 1120

Gly Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val Arg Val  
1125 1130 1135

Gly Ile Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr Val Gly  
1140 1145 1150

Asn Asn Asn Gly Lys Gly Ile Val Ile Asp Ser Lys Asp Gly Gln Asn  
1155 1160 1165

Thr Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn Asp Gly  
1170 1175 1180

Ala Gly His Ala Leu Ser Gln Gly Leu Ala Asn Asp Thr Asp Lys Thr  
1185 1190 1195 1200

Arg Ala Ala Ser Ile Gly Asp Val Leu Asn Ala Gly Phe Asn Leu Gln  
1205 1210 1215

Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asp



Substitute SeqListing.txt

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Phe Ile Asp Gly Asn Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr  
1235 1240 1245  
Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val Asp Asn Lys Thr  
1250 1255 1260  
Ile Glu Val Thr Ser Asp Lys Lys Leu Gly Val Lys Thr Thr Thr Leu  
1265 1270 1275 1280  
Thr Lys Thr Ser Ala Asn Gly Asn Ala Thr Lys Phe Ser Ala Ala Asp  
1285 1290 1295  
Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Ala Thr His Leu Asn Thr  
1300 1305 1310  
Leu Ala Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser Gln Ala Ser Ser  
1315 1320 1325  
Ser Ala Ser Tyr Val Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser  
1330 1335 1340  
Thr Asp Lys Lys Tyr Tyr Gln Val Asn Asp Lys Gly Gln Val Asp Lys  
1345 1350 1355 1360  
Asn Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro  
1365 1370 1375  
Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu  
1380 1385 1390  
Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala  
1395 1400 1405  
Phe Ile Lys Gly Leu Glu Asn Ala Ala Lys Asp Thr Lys Thr Lys Asn  
1410 1415 1420  
Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu  
1425 1430 1435 1440  
Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu Thr  
1445 1450 1455  
Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn  
1460 1465 1470  
Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala  
1475 1480 1485  
Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly Gly Thr Arg Ile  
1490 1495 1500  
Asp Glu Lys Gly Ile Ser Phe Val Asp Ala Asn Gly Gln Ala Lys Ala  
1505 1510 1515 1520  
Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Arg  
1525 1530 1535  
Ile Ser Asn Ile Gly Ala Ala Val Asp Asp Asn Asp Ala Val Asn Phe  
1540 1545 1550  
Lys Gln Phe Asn Glu Val Ala Lys Thr Val Asn Asn Leu Asn Asn Gln

# Substitute SeqListing.txt

1555

1560

1565

Ser Asn Ser Gly Ala Ser Leu Pro Phe Val Val Thr Asp Ala Asn Gly  
1570 1575 1580

Lys Pro Ile Asn Gly Thr Asp Gly Lys Pro Gln Lys Ala Ile Lys Gly  
1585 1590 1595 1600

Ala Asp Gly Lys Tyr Tyr His Ala Asn Ala Asn Gly Val Pro Val Asp  
1605 1610 1615

Lys Asp Gly Lys Pro Ile Thr Asp Ala Asp Lys Leu Ala Asn Leu Ala  
1620 1625 1630

Ala His Gly Lys Pro Leu Asp Ala Gly His Gln Val Val Ala Ser Leu  
1635 1640 1645

Gly Gly Asn Ser Asp Ala Ile Thr Leu Thr Asn Ile Lys Ser Thr Leu  
1650 1655 1660

Pro Gln Ile Asp Thr Pro Asn Thr Gly Asn Ala Asn Ala Gly Gln Ala  
1665 1670 1675 1680

Gln Ser Leu Pro Ser Leu Ser Ala Ala Gln Gln Ser Asn Ala Ala Ser  
1685 1690 1695

Val Lys Asp Val Leu Asn Val Gly Phe Asn Leu Gln Thr Asn His Asn  
1700 1705 1710

Gln Val Asp Phe Val Lys Ala Tyr Asp Thr Val Asn Phe Val Asn Gly  
1715 1720 1725

Thr Gly Ala Asp Ile Thr Ser Val Arg Ser Ala Asp Gly Thr Met Ser  
1730 1735 1740

Asn Ile Thr Val Asn Thr Ala Leu Ala Ala Thr Asp Asp Asp Gly Asn  
1745 1750 1755 1760

Val Leu Ile Lys Ala Lys Asp Gly Lys Phe Tyr Lys Ala Asp Asp Leu  
1765 1770 1775

Met Pro Asn Gly Ser Leu Lys Ala Gly Lys Ser Ala Ser Asp Ala Lys  
1780 1785 1790

Thr Pro Thr Gly Leu Ser Leu Val Asn Pro Asn Ala Gly Lys Gly Ser  
1795 1800 1805

Thr Gly Asp Ala Val Ala Leu Asn Asn Leu Ser Lys Ala Val Phe Lys  
1810 1815 1820

Ser Lys Asp Gly Thr Thr Thr Thr Thr Val Ser Ser Asp Gly Ile Ser  
1825 1830 1835 1840

Ile Gln Gly Lys Asp Asn Ser Ser Ile Thr Leu Ser Lys Asp Gly Leu  
1845 1850 1855

Asn Val Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp  
1860 1865 1870

Thr Asp Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu  
1875 1880 1885

Gly Leu Gly Asn Ala Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn

# Substitute SeqListing.txt

1890 1895 1900  
Ile Ala Asp Ile Lys Lys Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg  
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Thr Val Ile Lys Ala Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp  
1925 1930 1935  
Thr Glu Lys Leu Ala Thr Gly Gly Val Gln Val Gly Val Asp Lys Asp  
1940 1945 1950  
Gly Asn Ala Asn Gly Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys  
1955 1960 1965  
Asp Gly Ser Lys Lys Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln  
1970 1975 1980  
Thr Asn Tyr Leu Thr Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn  
1985 1990 1995 2000  
Glu Gln Gly Ile Arg Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro  
2005 2010 2015  
Val Val Gln Gly Arg Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His  
2020 2025 2030  
Ser Val Ala Ile Gly Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val  
2035 2040 2045  
Ala Ile Gly Arg Gln Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly  
2050 2055 2060  
Asp Asn Ala Gln Ala Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly  
2065 2070 2075 2080  
Asn Val Val Thr Gly Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr  
2085 2090 2095  
Val Lys Ala Asp Asn Ser Tyr Ser Val Gly Asn Asn Asn Gln Phe Ile  
2100 2105 2110  
Asp Ala Thr Gln Thr Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val  
2115 2120 2125  
Thr Glu Ser Asn Ser Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala  
2130 2135 2140  
Gly Thr His Ala Gly Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly  
2145 2150 2155 2160  
Thr Thr Thr Thr Ala Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly  
2165 2170 2175  
Gln Thr Ala Val Gly Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg  
2180 2185 2190  
Arg Ile Gln Asn Val Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp  
2195 2200 2205  
Ala Val Asn Gly Ser Gln Leu Tyr Lys Ala Thr Gln Gly Ile Ala Asn  
2210 2215 2220  
Ala Thr Asn Glu Leu Asp His Arg Ile His Gln Asn Glu Asn Lys Ala

2225	2230	2235	2240
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Asn Ala Gly Ile Ser Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala  
2245 2250 2255

Tyr Ile Pro Gly Arg Ser Met Val Thr Gly Gly Ile Ala Thr His Asn  
2260 2265 2270

Gly Gln Gly Ala Val Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly  
2275 2280 2285

Gln Trp Val Phe Lys Ile Asn Gly Ser Ala Asp Thr Gln Gly His Val  
2290 2295 2300

Gly Ala Ala val Gly Ala Gly Phe His Phe  
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## Substitute SeqListing.txt

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# Substitute SeqListing.txt

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 Thr Ala Lys Ala Asp Gly Asp Arg Ala Ile Ala Ile Gly Glu Asn Ala  
 35 40 45  
 Asn Ala Gln Gly Gly Gln Ala Ile Ala Ile Gly Ser Ser Asn Lys Thr  
 50 55 60  
 Val Asn Gly Ser Ser Leu Asp Lys Ile Gly Thr Asp Ala Thr Gly Gln  
 65 70 75 80  
 Glu Ser Ile Ala Ile Gly Gly Asp Val Lys Ala Ser Gly Asp Ala Ser  
 85 90 95  
 Ile Ala Ile Gly Ser Asp Asp Leu His Leu Leu Asp Gln His Gly Asn  
 100 105 110  
 Pro Lys His Pro Lys Gly Thr Leu Ile Asn Asp Leu Ile Asn Gly His  
 115 120 125  
 Ala Val Leu Lys Glu Ile Arg Ser Ser Lys Asp Asn Asp Val Lys Tyr  
 130 135 140  
 Arg Arg Thr Thr Ala Ser Gly His Ala Ser Thr Ala Val Gly Ala Met  
 145 150 155 160  
 Ser Tyr Ala Gln Gly His Phe Ser Asn Ala Phe Gly Thr Arg Ala Thr  
 165 170 175  
 Ala Lys Ser Ala Tyr Ser Leu Ala Val Gly Leu Ala Ala Thr Ala Glu  
 180 185 190  
 Gly Gln Ser Thr Ile Ala Ile Gly Ser Asp Ala Thr Ser Ser Ser Leu  
 195 200 205  
 Gly Ala Ile Ala Leu Gly Ala Gly Thr Arg Ala Gln Leu Gln Gly Ser  
 210 215 220  
 Ile Ala Leu Gly Gln Gly Ser Val Val Thr Gln Ser Asp Asn Asn Ser  
 225 230 235 240  
 Arg Pro Ala Tyr Thr Pro Asn Thr Gln Ala Leu Asp Pro Lys Phe Gln  
 245 250 255  
 Ala Thr Asn Asn Thr Lys Ala Gly Pro Leu Ser Ile Gly Ser Asn Ser  
 260 265 270  
 Ile Lys Arg Lys Ile Ile Asn Val Gly Ala Gly Val Asn Lys Thr Asp

# Substitute SeqListing.txt

275

280

285

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 305 310 315 320  
 Gly Leu Asp Asn Thr Leu Thr Ile Lys Gly Gly Ala Glu Thr Asn Ala  
 325 330 335  
 Leu Thr Asp Asn Asn Ile Gly Val Val Lys Glu Ala Asp Asn Ser Gly  
 340 345 350  
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 355 360 365  
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 370 375 380  
 Ser Thr Thr Ala Glu Leu Leu Ser Asp Ser Leu Thr Phe Thr Gln Pro  
 385 390 395 400  
 Asn Thr Gly Ser Gln Ser Thr Ser Lys Thr Val Tyr Gly Val Asn Gly  
 405 410 415  
 Val Lys Phe Thr Asn Asn Ala Glu Thr Thr Ala Ala Ile Gly Thr Thr  
 420 425 430  
 Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Arg Asp Gly Asp Val Asp  
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 Glu Lys Gln Ala Pro Tyr Leu Asp Lys Lys Gln Leu Lys Val Gly Ser  
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 Val Ala Ile Thr Ile Asp Asn Gly Ile Asp Ala Gly Asn Lys Lys Ile  
 465 470 475 480  
 Ser Asn Leu Ala Lys Gly Ser Ser Ala Asn Asp Ala Val Thr Ile Glu  
 485 490 495  
 Gln Leu Lys Ala Ala Lys Pro Thr Leu Asn Ala Gly Ala Gly Ile Ser  
 500 505 510  
 Val Thr Pro Thr Glu Ile Ser Val Asp Ala Lys Ser Gly Asn Val Thr  
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 Gly Thr Ser Asp Lys Phe Ser Val Lys Gly Ser Gly Thr Asn Asn Ser  
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 Thr Ala Asp Ser Ala Leu Gln Ser Phe Thr Val Lys Glu Glu Asp Asp  
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# Substitute SeqListing.txt

610 615 620

Ala Thr Lys Lys Asp Gly Thr Val Thr Phe Gly Leu Ser Gln Asp Ser  
625 630 635 640

Gly Leu Thr Ile Gly Lys Ser Thr Leu Asn Asn Asp Gly Leu Thr Val  
645 650 655

Lys Asp Thr Asn Glu Gln Ile Gln Val Gly Ala Asn Gly Ile Lys Phe  
660 665 670

Thr Asn Val Asn Gly Ser Asn Pro Gly Thr Gly Ile Ala Asn Thr Ala  
675 680 685

Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Gly Ser Asp Gly Ala Val  
690 695 700

Asp Thr Asn Lys Pro Tyr Leu Asp Gln Asp Lys Leu Gln Val Gly Asn  
705 710 715 720

Val Lys Ile Thr Asn Thr Gly Ile Asn Ala Gly Gly Lys Ala Ile Thr  
725 730 735

Gly Leu Ser Pro Thr Leu Pro Ser Ile Ala Asp Gln Ser Ser Arg Asn  
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Ile Glu Leu Gly Asn Thr Ile Gln Asp Lys Asp Lys Ser Asn Ala Ala  
755 760 765

Ser Ile Asn Asp Ile Leu Asn Thr Gly Phe Asn Leu Lys Asn Asn Asn  
770 775 780

Asn Pro Ile Asp Phe Val Ser Thr Tyr Asp Ile Val Asp Phe Ala Asn  
785 790 795 800

Gly Asn Ala Thr Thr Ala Thr Val Thr His Asp Thr Ala Asn Lys Thr  
805 810 815

Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile His Leu  
820 825 830

Thr Gly Thr Asp Asp Asn Lys Lys Leu Gly Val Lys Thr Thr Lys Leu  
835 840 845

Asn Lys Thr Ser Ala Asn Gly Asn Thr Ala Thr Asn Phe Asn Val Asn  
850 855 860

Ser Ser Asp Glu Asp Ala Leu Val Asn Ala Lys Asp Ile Ala Glu Asn  
865 870 875 880

Leu Asn Thr Leu Ala Lys Glu Ile His Thr Thr Lys Gly Thr Ala Asp  
885 890 895

Thr Ala Leu Gln Thr Phe Thr Val Lys Lys Val Asp Glu Asn Asn Asn  
900 905 910

Ala Asp Asp Ala Asn Ala Ile Thr Val Gly Gln Lys Asn Ala Asn Asn  
915 920 925

Gln Val Asn Thr Leu Thr Leu Lys Gly Glu Asn Gly Leu Asn Ile Lys  
930 935 940

Thr Asp Lys Asn Gly Thr Val Thr Phe Gly Ile Asn Thr Thr Ser Gly



# Substitute SeqListing.txt

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                                  980                                   985                                   990  
 Phe Ala Lys Val Asn Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly  
                                  995                                   1000                                   1005  
 Thr Thr Arg Ile Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly  
                                  1010                                   1015                                   1020  
 Ser Leu Asp Lys Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala  
                                  1025                                   1030                                   1035                                   1040  
 Gly Gly Lys Lys Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Gln Asn  
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 Ser His Asp Ala Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu  
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 Leu Glu Asn Lys Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu  
                                  1075                                   1080                                   1085  
 His Glu Phe Ser Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser  
                                  1090                                   1095                                   1100  
 Asn Pro Tyr Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr  
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 Phe Ala Gly Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val  
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 Val Gly Asn Asn Asn Gly Lys Gly Ile Val Ile Asp Ser Gln Asn Gly  
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 Gln Asn Thr Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn  
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 Asp Lys Gly Ser Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp  
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 Glu Asp Lys Thr Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly  
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 Phe Asn Leu Gln Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr  
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 Tyr Asp Asp Thr Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val  
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 Asp Asp Thr Thr Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr  
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# Substitute SeqListing.txt

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 1330 1335 1340  
 Ile Tyr Asp Ser Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly  
 1345 1350 1355 1360  
 Thr Val Asp Lys Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln  
 1365 1370 1375  
 Ala Gln Thr Pro Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val  
 1380 1385 1390  
 Ile Asn Lys Glu Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn  
 1395 1400 1405  
 Glu Asp Asn Ala Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn  
 1410 1415 1420  
 Lys Thr Lys Asn Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala  
 1425 1430 1435 1440  
 Gln Thr Pro Leu Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys  
 1445 1450 1455  
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 1460 1465 1470  
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 1475 1480 1485  
 Val Lys Leu Ala Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly  
 1490 1495 1500  
 Gly Thr Lys Ile Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly  
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 Gln Ala Lys Ala Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu  
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 Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp  
 1540 1545 1550  
 Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu  
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 Gly Asn Ala Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala  
 1570 1575 1580  
 Asp Ile Lys Lys Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val  
 1585 1590 1595 1600  
 Ile Lys Ala Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu  
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# Substitute SeqListing.txt

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 1650 1655 1660  
 Tyr Leu Thr Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln  
 1665 1670 1675 1680  
 Gly Ile Arg Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val  
 1685 1690 1695  
 Gln Gly Arg Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val  
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 Gly Arg Gln Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn  
 1730 1735 1740  
 Ala Gln Ala Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val  
 1745 1750 1755 1760  
 Val Ala Gly Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys  
 1765 1770 1775  
 Ala Asp Asn Ser Tyr Ser Val Gly Asn Asn Asn Gln Phe Thr Asp Ala  
 1780 1785 1790  
 Thr Gln Thr Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu  
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 Asn Glu Leu Asp His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala  
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 Gly Ile Ser Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile  
 1925 1930 1935  
 Pro Gly Arg Ser Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln  
 1940 1945 1950  
 Gly Ala Val Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp

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1985	1990		
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aaggtaaacc catatgaatc acatctataa agtca			35
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<210> 19			
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cgctcgctgt ccatatgatc ggtgcaacgc tca			33

Substitute SeqListing.txt

<210> 20	
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# Substitute SeqListing.txt

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<210> 29
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<210> 30
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<210> 31
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<400> 31
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<210> 32
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<400> 32
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<210> 33
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<213> Moraxella catarrhalis

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Substitute SeqListing.txt

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<210> 35  
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<400> 35  
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<210> 36  
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<400> 36  
His Tyr Gln Gly Gly Lys  
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<210> 37  
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<400> 37  
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<210> 38  
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<400> 38  
Gly Val Val Lys  
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<210> 39  
<211> 5  
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<400> 39  
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1 5

<210> 40  
<211> 5

# Substitute SeqListing.txt

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<213> Moraxella catarrhalis

<400> 40

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<210> 41

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<400> 41

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33

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43

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43

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<213> Moraxella catarrhalis

<400> 44

Gly Thr Gly Asn Val Val Ala Gly Lys  
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<210> 45

<211> 3135

<212> DNA

<213> Moraxella catarrhalis

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gatggcgtga agtttgccaa ggtaataaat aatgggtgtg taggtgctgg cattgatggc 180  
acaactcgca ttaccagaga tgaattggc tttactggga ctaatggctc acttgataaa 240  
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caatcagggtg agattgcccc aaacagccat gatgctgtga caggcggcaa gatttatgat 360  
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agttatgaca cctcaaagac ctctgatgtc atcacctttg cagggtgaaaa cggcattacc 540  
accaaggtaa ataaagggtgt ggtgcgtgtg ggcattgacc aaaccaaagg cttaaccacg 600  
cctaagctga ccgtgggtaa taataatggc aaaggcattg tcattgacag ccaaaatgggt 660



# Substitute SeqListing.txt

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tatgatgaca	caagcaaaac	cagtaaagtg	gtctatgatg	tcaatgtgga	tgatacaacc	960
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<211> 1044

<212> PRT

<213> Moraxella catarrhalis

<400> 46

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			20					25					30		

Ser	Glu	Gln	Ile	Gln	Val	Gly	Ala	Asp	Gly	Val	Lys	Phe	Ala	Lys	Val
	35					40					45				

Asn	Asn	Asn	Gly	Val	Val	Gly	Ala	Gly	Ile	Asp	Gly	Thr	Thr	Arg	Ile
	50					55				60					

Thr	Arg	Asp	Glu	Ile	Gly	Phe	Thr	Gly	Thr	Asn	Gly	Ser	Leu	Asp	Lys

Substitute SeqListing.txt

65                      70                      75                      80

Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala Gly Gly Lys Lys  
                                  85                      90                      95

Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Gln Asn Ser His Asp Ala  
                                  100                      105                      110

Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn Lys  
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Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu His Glu Phe Ser  
                                  130                      135                      140

Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr Ser  
                                  145                      150                      155                      160

Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr Phe Ala Gly Glu  
                                  165                      170                      175

Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val Arg Val Gly Ile  
                                  180                      185                      190

Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr Val Gly Asn Asn  
                                  195                      200                      205

Asn Gly Lys Gly Ile Val Ile Asp Ser Gln Asn Gly Gln Asn Thr Ile  
                                  210                      215                      220

Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn Asp Lys Gly Ser  
                                  225                      230                      235                      240

Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp Glu Asp Lys Thr  
                                  245                      250                      255

Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly Phe Asn Leu Gln  
                                  260                      265                      270

Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asn  
                                  275                      280                      285

Phe Ala Asp Gly Asn Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr  
                                  290                      295                      300

Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr  
                                  305                      310                      315                      320

Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr Thr Thr Leu Thr  
                                  325                      330                      335

Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser Asn Gln Ala Thr  
                                  340                      345                      350

Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala His Leu Asn Thr  
                                  355                      360                      365

Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser Gln Ala Asn Asn  
                                  370                      375                      380

Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser  
                                  385                      390                      395                      400

Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp Lys

# Substitute SeqListing.txt

405 410 415  
 Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro  
 420 425 430  
 Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu  
 435 440 445  
 Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala  
 450 455 460  
 Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys Asn  
 465 470 475 480  
 Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu  
 485 490 495  
 Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu Thr  
 500 505 510  
 Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn  
 515 520 525  
 Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala  
 530 535 540  
 Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly Gly Thr Lys Ile  
 545 550 555 560  
 Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly Gln Ala Lys Ala  
 565 570 575  
 Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Val  
 580 585 590  
 Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn Val  
 595 600 605  
 Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu Gly Asn Ala Gly  
 610 615 620  
 Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala Asp Ile Lys Lys  
 625 630 635 640  
 Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val Ile Lys Ala Gly  
 645 650 655  
 Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala Thr  
 660 665 670  
 Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn Ala Asn Gly Asp  
 675 680 685  
 Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly Ser Lys Lys Ala  
 690 695 700  
 Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn Tyr Leu Thr Asn  
 705 710 715 720  
 Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg Phe  
 725 730 735  
 Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val Gln Gly Arg Asn  
 740 745 750

Substitute SeqListing.txt

740  
 Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val Ala Ile Gly Phe  
 755 760 765  
 Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile Gly Arg Gln Thr  
 770 775 780  
 Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn Ala Gln Ala Thr  
 785 790 795  
 Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val Val Ala Gly Lys  
 805 810 815  
 His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys Ala Asp Asn Ser  
 820 825 830  
 Tyr Ser Val Gly Asn Asn Asn Gln Phe Thr Asp Ala Thr Gln Thr Asp  
 835 840 845  
 Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu Ser Asn Ser Val  
 850 855 860  
 Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr His Ala Gly Thr  
 865 870 875 880  
 Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr Thr Thr Ala Gly  
 885 890 895  
 Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr Ala Val Gly Ala  
 900 905 910  
 Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile Gln Asn Val Ala  
 915 920 925  
 Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val Asn Gly Ser Gln  
 930 935 940  
 Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr Asn Glu Leu Asp  
 945 950 955 960  
 His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala Gly Ile Ser Ser  
 965 970 975  
 Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile Pro Gly Arg Ser  
 980 985 990  
 Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln Gly Ala Val Ala  
 995 1000 1005  
 Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp Val Phe Lys Ile  
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<210> 47  
 <211> 2448  
 <212> DNA

Substitute SeqListing.txt

<213> Moraxella catarrhalis

<400> 47

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<210> 48

<211> 816

<212> PRT

<213> Moraxella catarrhalis

<400> 48

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          20          25          30
Ser Glu Gln Ile Gln Val Gly Ala Asp Gly Val Lys Phe Ala Lys Val
          35          40          45
Asn Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly Thr Thr Arg Ile
          50          55          60

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# Substitute SeqListing.txt

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 85 90 95  
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 100 105 110  
 Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn Lys  
 115 120 125  
 Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu His Glu Phe Ser  
 130 135 140  
 Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr Ser  
 145 150 155 160  
 Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr Phe Ala Gly Glu  
 165 170 175  
 Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val Arg Val Gly Ile  
 180 185 190  
 Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr Val Gly Asn Asn  
 195 200 205  
 Asn Gly Lys Gly Ile Val Ile Asp Ser Gln Asn Gly Gln Asn Thr Ile  
 210 215 220  
 Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn Asp Lys Gly Ser  
 225 230 235 240  
 Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp Glu Asp Lys Thr  
 245 250 255  
 Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly Phe Asn Leu Gln  
 260 265 270  
 Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asn  
 275 280 285  
 Phe Ala Asp Gly Asn Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr  
 290 295 300  
 Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr  
 305 310 315 320  
 Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr Thr Thr Leu Thr  
 325 330 335  
 Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser Asn Gln Ala Thr  
 340 345 350  
 Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala His Leu Asn Thr  
 355 360 365  
 Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser Gln Ala Asn Asn  
 370 375 380  
 Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser  
 385 390 395 400

Substitute SeqListing.txt

Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp Lys  
 405 410 415  
 Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro  
 420 425 430  
 Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu  
 435 440 445  
 Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala  
 450 455 460  
 Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys Asn  
 465 470 475 480  
 Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu  
 485 490 495  
 Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu Thr  
 500 505 510  
 Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn  
 515 520 525  
 Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala  
 530 535 540  
 Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly Gly Thr Lys Ile  
 545 550 555 560  
 Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly Gln Ala Lys Ala  
 565 570 575  
 Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Val  
 580 585 590  
 Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn Val  
 595 600 605  
 Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu Gly Asn Ala Gly  
 610 615 620  
 Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala Asp Ile Lys Lys  
 625 630 635 640  
 Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val Ile Lys Ala Gly  
 645 650 655  
 Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala Thr  
 660 665 670  
 Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn Ala Asn Gly Asp  
 675 680 685  
 Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly Ser Lys Lys Ala  
 690 695 700  
 Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn Tyr Leu Thr Asn  
 705 710 715 720  
 Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg Phe  
 725 730 735

# Substitute SeqListing.txt

Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val Gln Gly Arg Asn  
740 745 750  
Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val Ala Ile Gly Phe  
755 760 765  
Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile Gly Arg Gln Thr  
770 775 780  
Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn Ala Gln Ala Thr  
785 790 795 800  
Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val Val Ala Gly Lys  
805 810 815

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<211> 720  
<212> DNA  
<213> Moraxella catarrhalis

<400> 49  
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catactctgta cgatttgaca tgtgatatga tttaacatgt gacatgattt aacattgttt 120  
aatactgttg ccatcattac cataatttag taacgcattt agtaacgcat ttgtaaaaat 180  
cattgcgccc ctttatgtgt atcatatgaa tagaatatta tgattgtatc tgattattgt 240  
atcagaatgg tgatgctata tgatgatgcc tacgagttga tttgggttaa tcactctatg 300  
atttgatata ttttgaaact aatctattga cttaaatacac catatggtta taatttagca 360  
taatggtagg ctttttgtaa aaatcacatc gcaatattgt tctactgtta ctaccatgct 420  
tgaatgacga tccaatcac cagattcatt caagtgatgt gtttgatata gcaccattta 480  
ccctaattat ttcaatcaaa tgcctatgtc agcatgtatc atttttttaa ggtaaaccac 540  
catgaatcac atctataaag tcatctttta caaagccaca ggcacattta tggcagtggc 600  
agagtacgcc aaatcccaca gcacgggggg gggtagctgt gctacagggc aagttggcag 660  
tgtatgcact ctgagctttg cccgtattgc cgcgctcgct gtcctcgtga tcggtgcaac 720

<210> 50  
<211> 60  
<212> PRT  
<213> Moraxella catarrhalis

<400> 50  
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Met Ala Val Ala Glu Tyr Ala Lys Ser His Ser Thr Gly Gly Gly Ser  
20 25 30  
Cys Ala Thr Gly Gln Val Gly Ser Val Cys Thr Leu Ser Phe Ala Arg  
35 40 45  
Ile Ala Ala Leu Ala Val Leu Val Ile Gly Ala Thr  
50 55 60

<210> 51  
<211> 5  
<212> PRT  
<213> Moraxella cattarhalis

<400> 51  
Val Val Ala Gly Lys



Substitute SeqListing.txt

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